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ABSTRACT

This document consists of short reviews of 13 Ohio schools. The goal is to illustrate each school's atmosphere and members through a report made by an education expert who actually visited the school, as opposed to a statistical report. Interviews of students and teachers are included, as are impressions of reform methods being used in the school, and the effectiveness of the reforms. The Ohio schools described in the sketches are divided into five categories: (1) Cincinnati Urban Systemic Initiative Schools; (2) Cleveland Urban Systemic Initiative Schools; (3) Columbus Urban Systemic Initiative Schools; (4) Appalachian Rural Systemic Initiative Schools; and (5) Non-Systemic Initiative Schools. Two more tales are included at the end: "What is Learned from Hands on Activities?" and "Care, Interest and Focusing on Tests: Sufficient Keys to Success in Science?" (JMD)

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Impressions of Reform in Ohio Schools

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Impressions of Reform in Ohio Schools

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Cincinnati

Urban Systemic Initiative Schools

Impressionistic Tale

Arta Damnjanovic - Miami University

Hutton Middle School

Bridging the Gap: Equity in Systemic Reform

The one word that can describe the impression I am left with after my site visits to Hutton Middle School is "paradox." There is a contradiction between how Hutton Middle School appears "on paper" and what I experienced during my visits. In the following paragraphs, I hope to explain this impression.

Hutton Middle School is a neighborhood school situated in Cityside. It sits on top of a steep incline overlooking the street below. Close to 50 stairs and a spectacular view of a large downtown city connect the public access entrance to the street below. The school building itself, is a two story brick structure. Both the building and school grounds are well kept.

Over 75% of the students who attended Hutton Middle School are Black and nearly 25% are White. Most came from families that received some form of government aid. For example, 75% of the students are on free or reduced lunch programs. Many of the older girls have children of their own and more than half of the boys belong to one of the areas' corner groups or gangs.

In the first year these site visits were conducted, conflict between rival gangs resulted in the violent death of four students. The faculty's frustration with these "useless deaths" is best summarized in the following speech given by the school principal:

> *[We must learn] not to create violence or be a part of violence. But if you are around violence - count on it. Somebody in your family—some of your friends—will have the same fate as Philip's.*
>
> *I know a lot of you have seen it. You've been involved in it. You belong to groups of kids - what they call gangs. If somebody does something to a friend of yours—you automatically have to go out and do something to a friend of theirs. That creates violence. That creates death.*
>
> *That is the reason why this year alone, we have lost four students—not counting all the other students [in past years]. So we need to try and avoid it [violence]. Stay away from it—so that we don't have to go to another funeral. Thank you. (principal intercom message, 5-12-95)*

Many Hutton students work substantially below grade level. For example, only 17.6% of the school's students score at or above the national average on the California Achievement Tests (CAT) for mathematics. The average mathematics Discovery Inquiry Test (M-DIT) score was 29.0%. The average Discovery Inquiry Test score for science (S-DIT) was 32.1%. These scores were one standard deviation below the study's overall M-DIT and S-DIT means (i.e., 48.3% and 42.7%, respectively). As a consequence of this widespread academic failure, close to 60% of the eighth graders in the school, at the time of the site visits, were repeaters.

Student enrollment at Hutton Middle School has fluctuated over the past decade. It declined steadily after the 1984 court ruling to make magnet schools a legal means of school desegregation. After the ruling, many schools began to establish alternative, or magnet, programs to compete for "high quality" students. In the mid-1980's Hutton students tested their way into many of these schools. As a result, enrollment in Hutton and other neighborhood schools dropped. Many were closed due to the low enrollment (Spring, 1995).

In the late 1980's and early 1990's, enrollment in many neighborhood schools, including Hutton, began to skyrocket again. The explanation given for the increase was that students who could not get into (or were expelled from) magnet programs were defaulted into neighborhood schools (Spring, 1995). Like other neighborhood schools, Hutton had no legal method for selecting students. It had to allow anyone within a specified geographic location in, regardless of their academic or behavioral record. The school quickly became overcrowded. Behavior became an issue. As summarized by one teacher,

> *Alternative programs are allowed to establish criteria for admission, whereas a neighborhood school, like Hutton, is obliged to take in the people living within certain boundaries. The kids we get at the end of the year are kids that have been expelled from other schools. That's why our classrooms are so crowded. That's why we have so many behavior problems.*

Despite the schools poor academic and behavior reputation, I witnessed positive classroom interactions and few scenes of violence or chaos. Students in Mr. M's science classrooms, for example, appeared alert and eager to learn. High order questions were asked. These questions often drove and directed inquiry-based activities. The following vignette provides evidence for this statement. In the vignette students were asked to answer the following question: What acid has the formula HCl and what is its source?

Mr. McCarthy asks who wants to answer the question. Four hands go up. Mr. McCarthy asks an African American female to answer.

Mr. McCarthy:	*Okay, Miss T*
Ms. T:	*The formula of acid is Hy - dro -chloric acid and ahm and it's a source of... Can I spell it?*
Mr. McCarthy:	*O.K.*
Ms. T:	*G-A-S-T-R-I-C juice in the stomach.*
Mr. McCarthy:	*Good. That means the juice in your stomach that is used to digest food. Yah, the juice in your stomach is really a strong acid and your body uses it to help break down the food you eat.*
African American male:	*But, why don't it eat up your living flesh?*
Mr. McCarthy:	*That is a very good question.*
Another African American male:	*Because of the membrane.*
Mr. McCarthy:	*Very good, Mr. M. What about the membrane?*
Mr. M:	*Your stomach's got a membrane protecting it.*
Mr. McCarthy:	*That's right and it's got a saliva coating. That kind of helps protect it, too. Your throat doesn't have that membrane. It's not meant to have that strong acid on it.*

African American female raises her hand. Mr. McCarthy calls on her.

African American female:	*All right - how come we get heartburn? I mean if we have that membrane and all?*

Mr. McCarthy: *Yet, another good question! Again, I'm not sure. But I think that your stomach can take just so much acid. After you get too much - it starts fighting back. When it's fighting back is what you feel as heartburn. Can anyone help me answer Ms. J's question?*

No hands go up. Several students shake their heads - no.

Mr. McCarthy: *Anyone want to do some research to find out?*

Furthermore, the principal and teachers I spoke with did not complain about belligerence or open hostility. Instead they talked about the lack of motivation, silliness, and poor student achievement.

The paradox between the high order learning students exhibited in Mr. M's science class and their low achievement test scores in science and mathematics has been investigated among African American students. The reform efforts that have been suggested for addressing this paradox include "bridging the gap" between students' home and school communities, granting students "voice" in the classroom, and using class time to confront inconsistencies between students' school and home cultures (Ogbu, 1997). These reforms have not been instigated at this school. Instead, the largest school-wide reform effort discussed was helping students pass the new science proficiency test.

Silence in School (and No Bells Ring)

Impressionistic Tale

Jane Butler Kahle - Miami University

Steele Middle School

Bridging the Gap: Equity in Systemic Reform

My most vivid impression of Steele Middle School was silence. *Silence* as groups of students passed in orderly, single files between classes. Those files of predominately African American teenagers hugged the walls. Two or three teachers monitored each column, often with one teacher starting the group on its brief journey between classrooms and another one collecting it enroute. When observed from the end of a corridor—or glimpsed suddenly from around a corner—the lines clinging to the walls, often with eyes averted and heads down, reminded me of prison lines in movies. *Silence* during the search of backpacks in the hope of unearthing the culprit who defaced the walls of the girls' restroom the preceding hour. *Silence* as the principal singled out three girls to accompany him singly to the hall to discuss the contents of their backpacks. *Silence* in the orderly tidying of a science classroom prior to passing. Except in one classroom—of a teacher who was described (and observed) as having poor classroom management skills—I heard no laughter in two days!

The silence is the result of both the philosophical foundation of Paideia and the pragmatic management of team-based education. First, the principal describes one of the underlying tenets of the Paideia philosophy to be the provision of a safe and orderly environment for learning. As he stated,

> *We all believe we have a very good place to work, and we all want to keep it a good place to work. We are all dedicated to seeing that our students are successful and [we try] to provide a quality education for our kids—all of the teachings of the Paideia philosophy in maintaining a disciplined atmosphere and focusing 100 percent on learning. (Principal interview May 22, 1997)*

Second, the entire school is divided into interdisciplinary learning teams that keep the same group of students for two years (seventh and eighth grades), and each team has the autonomy to set its own schedule. No bells ring in Steele and team groups move at various times, necessitating quiet in the halls.

But one wonders if the prison-like files or the Gestapo-like backpack search are really necessary to provide a "disciplined atmosphere," and what school must be like for teenagers who are so regimented. I found myself thinking, "Is this necessary or is it simply the result of a lack of connection between the administrative and teaching staffs and the students?" They truly seemed to be from two cultures—with little acceptance or understanding across those cultures—white, middle class teachers and principal and African American and Appalachian, lower class students. I pondered Michael Apple's writings on power; never had I seen students so powerless. Yet, Steele is a good school, one in which most kids learn; one in which teachers are happy, resulting in stability; one in which kids' attendance is around 90%; one in which there are no visible hall guards nor metal detectors.

Upon reflection, the backpack incident provides an overwhelming example of the lack of power of the students. Prior to entering the room, I noticed the principal in the hallway near Ms. Janet Arnett's class. She pulled me aside to ask if Mr. Bass "had filled me in." (He had twice left our interview immediately proceeding the class). I replied, "No," and she proceeded to do so.

Graffiti had been found in the girls' restroom immediately after the girls who were entering her next class had been on a scheduled bathroom break. The principal was there to apprehend the culprit!

As always, the students filed quietly into Ms. Arnett's class, taking their seats and sitting quietly without touching anything until she had individually called each by name, indicating that the class was orderly and ready to begin. But this time instead of beginning their science lesson, she asked all the boys to stand, collect their things, and leave the room (a teacher was waiting to escort them to the lunch room to wait). Janet tried to lighten the atmosphere by commenting that they would have a special activity. The principal, then, announced that writing had been found on the walls of the girls' bathroom and asked all the girls to empty their backpacks, purses, pockets. He announced to two female assistants and Ms. Arnett that what they were looking for was a "brown, grease pencil." Four adults began the search, which proceeded in silence, until Janet again attempted some levity. She found a bag of candy and asked, "Mr. Bass, can I keep any food I find?" She then disposed of the food. (Later I learned that students are not allowed to have food on their persons in the school). When Janet found gum, she asked, "Should I draw up the suspension papers, now?" She quietly assured the girl that she was only kidding (gum, too, is not allowed), but the girl threw the gum away immediately anyway.

Throughout the 15 minute search, not one student said anything—or moved unnecessarily. The silent search was only interrupted by Ms. Arnett's attempts to lighten the atmosphere. The principal and two search assistants left; the boys returned; and Janet quietly and efficiently started her class. She obviously is both well liked and highly respected. The students worked individually and in groups on a variety of self-guided experiments with sound. All was back to normal, when the principal reappeared to pull out three girls individually, interrupting each time to announce a name from the front of the room. Again, when each returned, there were no comments or unusual behavior, the students and Ms. Arnett continued working quietly.

During my final interview when both the students and I were comfortable with each other, I asked a group of five girls (one Appalachian and four African American) about the hall passing. The discussion again indicated students' almost total lack of power. Their comments supported that what I had observed was not unusual. The beige-tiled halls are bordered in brown tile, one square wide. Students must always have their right foot on the brown tiles; if they sway away from the wall, they are reprimanded. Anytime they are in the hall, they must follow the same routine. In other words, unless a visitor is there to provide distraction and/or protection, they can never walk in the center of the hall—or on the beige tiles.

When I couldn't grasp what one student meant by "walking on the brown tiles" to a locker that was on the opposite side of the hall, another girl demonstrated. Students cling to the right side of the hall until they are directly opposite their locker; only then may they cross by walking on the beige tiles.

Although four of the girls had attended elementary schools with similar passing rules, none expected to find such rigidity in middle school. As one said,

> *I think that it is really strict because we are in junior high and [they should] try to prepare us for high school. And in high school you don't have to walk in single file lines. You have to find your classes on time...and be responsible for your own self. I think it's kind of hard to learn that when you are required to walk in a straight line. (Student # 5, May 23, 1997)*

As my observations continued, I found that there was silence on another matter—the issue of equity. Try as I might, I could not get anyone to address student diversity or equity—in terms of inclusion (disabled students), gender, or racial groups. The principal, for example, flatly denied that diversity was an issue. As he said,

I can't remember a racial incident in the time I've been here; [that is,] a white student and a black student having a problem that was related to race. They may have had a problem but it was nothing other than two kids having a problem, and one happened to be white and the other black. We need more minority staff members, and are working on that with some of the hiring that we are going to do this year. That really helps with the diversity of our staff. Right now, we just don't have enough. Our staff is too white. (Principal interview, May 22, 1997)

The kids, however, saw things differently—or, perhaps, they were more outspoken. An interview with two Appalachian girls suggested that their lives were confounded by being part of the minority group.

Interviewer: *What kind of school would you choose to go to?*

Student 6: *Maybe an all girls' school or something.*

Student 7: *I would try to go to a school that is a more white school. [Pause] Rather, well, I know that boys would put me down still, so if I went to a private school, then I would be just like everybody else, cause you wear the same shirt and same skirt.*

She continued: *I'm not a racist or anything, because I've got two black brothers and two black sisters that are adopted. I'm not racist. And I don't go down calling people 'nigger' or anything. But they [black students] come up to me and call me--like a "slut," a "honky." They call me names because I wear backwards jeans and such. (Student 7, May 23, 1997)*

Silence in the classrooms and in the corridors. *Silence* about racism and rules. All but one of the science and mathematics teachers in Steele have completed a six-week Discovery institute. There is a critical mass of reformers in the school. What are the barriers to true reform and how do we help dismantle them? How can the silence be used to provide a true learning community? How can Steele fulfill its potential?

Epilogue

A post-observation visit with Ms. Arnett allowed me to learn the outcome of the backpack search. Two of the girls who were called from the room identified the third one as the culprit. She denied the misdemeanor, but was expelled from school anyway. She was the seventh child in her family to attend Steele, and the expulsion stuck—in spite of her parent's protestations. This is a magnet school so parents have to line up at the crack of dawn to ensure a child's place. These are caring parents, parents who are loyal to the school. Janet is worried about them, their family, and the message sent to their daughter and the community.

Impressionistic Tale

Arta Damnjanovic - Miami University

Turner Middle School

Bridging the Gap: Equity in Systemic Reform

Turner Middle School is located in Central City Gardens, an upper middle class neighborhood, in the near-Northeast end of a large city. The manicured lawns and attractive homes paint a pleasant picture for visitors to the community. Safety does not appear to be an issue in Central City Gardens. Erie Avenue, on which the school is situated, is often filled with early morning joggers and late night strollers. Police car sirens are seldom heard (field notes, 5-2-95).

Businesses seem to thrive in this community. Half a mile from the school is an outdoor shopping area filled with quaint cafes and specialty stores. The cafes are teeming with customers at all hours of the day and the stores bustle with activity (field notes, 5-2-95).

The United States census report described Central City Gardens as an urban community with a population of 5,184 people. Up to 93.9% of the Central City Gardens residence were reported to be white, 4.8% were African-American, and .09% were of either Asian, Hispanic or Native American origin. Within this community, 92.3% of the adults who were 25 years of age or older, at the time of the census, graduated from high school. Close to 53% of Central City Gardens residence had earned bachelor degrees. Graduate or professional degrees were also earned by 23.3% of the population (U.S. Department of Commerce, 1993).

In 1990, only 1.1% of the individuals in Central City Gardens were unemployed. The average annual income for a family was $58, 661. Homeowners made up 43.6% of the Central City Gardens residents. The median retail value for homes in this community was $110,700 (U.S. Department of Commerce, 1993).

The School

Turner Middle School, situated in Central City Gardens, is not easily seen from Erie Avenue on which it is located. This is partially because a row of large trees and thick, well trimmed shrubs surround the school. The school building itself is old but well built. It is a single level brick structure whose form fits well into the architecture of the affluent Central City Gardens neighborhood.

From the inside, however, a different picture can be painted. Although clean and tidy, this school is generic and bland. Barren oatmeal gray walls and pale green doors give the visitor a closed in feeling. There are no windows in the hallways and few in the classrooms. No posters or pictures decorate the gray walls and all student work is kept inside classrooms.

This is a school where students are angry at each other, frustrated at their teachers, and annoyed with their parents and themselves. Students run the school. It's a school filled with teachers who have been in the system for more than 20 years. Many of the teachers are tired. Some are just putting time in until they retire. Those that are not tired are frustrated by the lack of interest exhibited by their colleagues and their students. My impression of the Turner Middle School is best captured in the following student interviews:

Student 1: This school? Man, the kids run this school. This school is rough man! Ghetto school. We be out of control. (Student 1 interview, 5-9-97)

Student 2: *This class? Ms. H be having a hard time with people listening and stuff. She know a lot. She not dumb. But, most of the class—they don't listen. (Student 3 interview, 5-9-97)*

Student 3: *The teachers in this school don't do no work. They don't teach us nothing. We just sit and talk. The only thing we learn in this school is math. Mr. M is a good [math] teacher. He makes you do work. Others act like they scared of us. (Student interview 5, 5-9-97)*

Student 4: *I don't do nothing at home that helps me with this class. They [guardians] don't care about what I do in school. (Student interview 8, 5-8-97)*

Turner Middle School is a neighborhood school. However, most of the 720 students who attend the school do not live in Central City Gardens, the community in which the school is situated. Instead, students come from less affluent areas in Metro County. Therefore, the demographics of the school do not match that of the surrounding community. Whereas the community is composed of 94% White and 5% African American residence, the school is composed of 85% African American and 15% White students. Over 10% of the White students were identified as Appalachian by the principal.

Reforms at Turner Middle School

Two school-wide reform initiatives, Expeditionary Learning and Future Success, were widely discussed during my three-day site visit. One team at Turner Middle School reported great success with these reform initiatives. However, the other two teams at this school only experienced moderate success with these reforms. The moderate success was attributed to the overwhelming time demand that the reforms required.

Both Expeditionary Learning and Future Success focus on tapping the human resources of the affluent Central City Gardens community. Expeditionary Learning is an interdisciplinary approach that is based on the premise that all students can learn, although they may acquire understanding through different instructional strategies. This initiative is informed by ten design principles and organizes students' education into purposeful expeditions of inquiry, discovery, and action. Families and communities are important partners in teaching and learning. Strengthening connections between school and community is important.

Future Success focuses on community involvement in public school education. Adults from local communities volunteer their time to assist teachers with classroom instruction or help students with specific out-of-class projects. The adults also serve as role models for students. They answer career-specific questions and discuss obstacles they had to overcome to become successful in their chosen field. A few of the adults may even volunteer to mentor a student in their chosen profession.

As an outsider looking in, I wonder if the initiatives would have been better represented by a partnership that tapped resources found within students' home communities, instead of those found in the more affluent Central City Gardens neighborhood. I don't know why individuals from students' home communities didn't participate in the Expeditionary Learning or Future Success reforms. A number of reasons are possible. Central City Gardens residents may have been eager to participate in the reform initiatives. Individuals from students' home communities may have been difficult to contact. Whatever the reason, I question whether the school's association with the more affluent community will help build a school-community bond that is needed to address the anger, frustration, and apathy present in this school.

Cleveland

Urban Systemic Initiative Schools

Gender Equity: The Other Side of the Coin

Impressionistic Tale

Jane Keiser - Miami University

J. Adams Middle School

Bridging the Gap: Equity in Systemic Reform

I had heard of single-sex classrooms and I knew of people who had gone to single-sex schools, but this arrangement in a public school was new to me. I was intrigued because, having been a lone female in many of my upper division mathematics classes, I remember feeling like a stranger. The males were competitive and driven to work out each problem on their own. To share their thinking with others was viewed as a weakness. Was I the only member of the class who needed to verbalize my thinking in order to make sense of the content? It would have been so nice to have another female with whom to converse. So the idea of having this option available to younger females at the beginning of their formal mathematics training sounded like a great idea to me.

Mr. Stevens, the seventh-grade science teacher at J. Adams Middle School, in his phone call described a trade that had been made at the beginning of the school year. In this trade, he and the seventh-grade mathematics teacher, Mrs. Nielson, exchanged males for females so that during the first period, he taught science to all of the males, and she taught mathematics to all of the females. During second period they would trade. They reasoned that since the assertive and boisterous males often squelched the participation from females, by segregating the males from the females, the females would be more likely to get involved. This struck a chord with me. Could this have been the solution when I was a student?

I parted for J. Adams Middle School, eager to see the success of this approach. All the time, I had in mind the girls. I wanted this attempt to be successful in helping girls to get involved in mathematics. Would the girls feel more comfortable in the classroom? Would they benefit from working in groups with other girls? Would their confidence increase? How, if at all, would their performance improve? These and other questions encompassed my thinking and made the five-hour drive to the city go by quickly. I had high hopes for the girls.

I imagined that both the boys and the girls would benefit from this single-sex arrangement. The girls would finally get the chance to speak and be heard, and the boys, having lost their reason to "show off," could now concentrate on their mathematics and use their competitiveness to a better end. However, the boys seemed to have gotten lost in this shuffled trade.

I watched while the girls received instruction that involved storytelling, group explorations, and interesting mathematical and scientific conversations where the students felt free to express themselves. The boys' instruction, while similar in content, seemed to take on a whole different tone. Their instruction tended to be more structured and controlled. Questions were generally of the one-answer-right-or-wrong variety, leaving no opportunities for the good discussions heard in the girls' class.

Why the difference? Here was my initial reasoning: When the boys first entered their classrooms, they were loud and cantankerous. Several walked in late, without excuses, interrupting class each time by drawing attention to themselves. "What's a teacher to do?" I thought. I reasoned that perhaps the structured, controlled teaching environment was intended to balance the less-than-controlled boys. However, on second thought, I wondered if it just might be

the other way around. Could it be that the structured environment caused, at least in part, some of the boys' disinterest and, thus, their expressive behavior? This second thought was supported as I walked among the groups of boys as they worked on their homework. I posed questions to them that challenged them to think beyond what their homework entailed. Their faces lit up at the challenge. I found myself wondering if this kind of challenge could help to cure the apparent discipline problem. It was the chicken-or-the-egg question. I still don't know the answer.

It's a paradox. In giving the girls more opportunities to experience good learning, the boys in this case seemed to end up in a dilemma similar to that previously experienced by the girls. The girls now had a better environment in which to learn, and their scores have improved, but was this what the teachers had in mind for the boys? Perhaps it was. Mr. Stevens suggested that genetics play a big role in the behavior of all boys:

> *I like [the single-sex grouping]. It kind of puts all of the like-thinking students in one class. You know, boys have one way of thinking, girls have another. . . . It's hard-wired in, it's the way they are. I don't think it has anything to do with the way they were brought up.*

I left J. Adams Middle School concerned. I was worried about equity. Can it be achieved? If so, how? People with good intentions made earnest attempts to correct an inequitable environment. Instead of finding a balance, they succeeded only in tipping the scales the other way. What is the solution? I left feeling that single-sex classrooms have promise, but that equity won't come easy. The teachers remained confident that improvements had been made. Perhaps this is true. And, perhaps more improvement is on the way.

But maybe they were just thinking of the girls.

Impressionistic Tale

Peter Hewson - University of Wisconsin - Madison

Urban Middle School

Bridging the Gap: Equity in Systemic Reform

The principal has a kite hanging on the wall of his office. He pointed it out to me with pride and told me its story. It was made by students in the math support classes. In order to make it they had measured dimensions, and calculated perimeters and areas; they had cut the cross struts that formed the backbone and the plastic sheeting that gave form and provided lift to the kite; they had constructed their kites, binding the main struts at right angles to each other, tying string around the perimeter to give it its outline, attaching the sheeting, and completing the kite with a colorful tail and a bridle that attached to a control line. Some of them decorated their kites. During the course of the day, all 180 students went outside to fly their kites.

Some of the kites didn't make it into the air. In some cases the material pulled away from the frame or the central struts weren't tightly bound. Other kites were unstable in flight, weaving left and right, up and down before they crashed into the ground. Among others, the strings and tails of the large flock of kites got entangled with each other. Some strings broke and other kites flew into the branches of surrounding trees. Some kites flew beautifully. They rose above the swirling breezes near the ground. They tugged at the kite strings, pulling out to the full extent of the string and effortlessly rode the wind.

Flying high above the ground, these kites provide a platform from which to view the school. You can look into the three story brick building with its open central courtyard that allows direct sunlight into the passageways and media center that surround the courtyard. You can see the field next to the school encircled by a running track. The trees lining the field are fresh with their new spring leaves. This is where the kites are launched and where children from a nearby elementary school gambol in the sun and heave mightily on a large rope in a tug-of-war competition. Beyond the school you can see the quiet streets of the neighborhood and the modest three story houses. There is an intermingling of churches, local businesses—Lou's Furniture, Perry's Family Restaurant, Craciun Funeral Home—and national chains of fast food outlets, pharmacies, food stores, and gas stations. A few blocks further is the lake with parks and beaches, fishing, yachts and powerboats, a water treatment plant, stock piles of raw materials.

High above the school, it is easier to see the large picture of the school and its place in the community. That is how the principal sees his job: to set goals and articulate high ideals for his teachers and students; and to reach out to the community—parents, organizations, businesses—for their support, encouragement, and active involvement in achieving those goals. One example of what the principal himself is doing is his active involvement in making the central courtyard a focal point of the school: he ensures that it is kept clean, he has purchased plants and flowers to grow and tables around which to sit, and he encourages teachers to use the space, not merely as an extra classroom, but as a site in which students can explore their local environment first hand.

On the ground, the school takes on a different look. In the courtyard a class is in session. The teacher has spread her students around the garden on widely separated benches. Their task is reading. Her task is to move around from bench to bench, responding to their questions and comments. On one side, two girls are sitting quietly at either end of a bench, books open in front of them, keeping one eye on the teacher who turns her back on them as she pays close attention to another student. One reaches across to the other and pokes her in the ribs. An arm swipes vigorously in retaliation and equally quickly subsides as the teacher shows signs of looking in their

direction. It is a modest altercation that stays well below the threshold of teacher knowledge and intervention.

At each of the four corners of the school building, on each of the three floors there is a fire alarm. Two students sit on chairs, chatting to one another; other students hang out with them. They tell me that they are there to monitor the fire alarm throughout the day, to dissuade other students from pulling the alarm. With twelve fire alarms in the school, there are more than 24 students on hall duty, more than the average attendance in a typical class.

The system of monitors isn't perfect. At a break between classes, the fire alarm erupts throughout the building. Everyone files out of their classrooms, out of the building, into the bright morning sunshine. There is no sense of panic. Some students stand around and talk, others jostle one another until a teacher tells them to cut it out. After a few minutes, it is time to head back inside: it had been a false alarm. A teacher records in her grade book that the class has missed 15 minutes due to the interruption. A glance at a few pages in her book shows that this is not a unique experience—several false alarms a day is common.

A week later the fire alarm monitors are gone. Once again an alarm breaks into a conversation, demanding attention, but this time no one moves. A short while later the principal is on the intercom to announce that everyone was to stay in class, that this was a false alarm. It turns out that the policy had been revised after the previous Friday when there had been 12 false alarms. The alarm pounds away in the background until the fire marshal gets there to deactivate it.

In between classes students are coming and going. Two boys start mouthing off at each other. One waves his hand in the other's face. They turn towards each other, fists clench, words become hard and jagged, and their personal space evaporates in an instant. They are lashing out at each other, wrestling, punching, falling to the ground, and rolling around trying desperately to get the upper hand. Teachers are yelling at them to stop. Finally the principal rushes in and pulls them apart. The atmosphere is heavy, tense, jittery, unsettled. It is not conducive to education. The next day, at least one of the fighters is back in class.

The kite is a metaphor with multiple meanings. It can symbolize individual students. Which of them is going to fly? If they don't, what are the problems that keep them grounded? Are these problems that are inherent in the kite itself, in its design, its materials, its construction? Or are they problems that arise from circumstances external to the kite: a lack of people who can identify and correct design and construction flaws; other kites that are unstable and fly into them, crippling them, knocking them off course, severing their anchor lines? At Urban Middle School, the number of kites that fly high above the ground is low. For many, the thought that flying is desirable, let alone possible, may never have occurred as a realistic option; living on the ground is a full-time, all-encompassing endeavor.

The kite also symbolizes the challenge for those who have responsibility for urban schools. There needs to be a vital connection between the kite and the ground, between a principal's ideals, dreams, aspirations, hopes, and the actions of and interactions between inhabitants of the school, going about their daily lives. One needs to be aware of and responsive to the other, reflecting between ground and kite the goals, the problems, the characteristics of each end. Both ends need to work in concert with each other. Yet the line that connects kite to ground at Urban Middle School seems fragile and tenuous, not tightly woven, unable to carry effectively the communication between the components at either end. It isn't easy for a kite to take off and fly, particularly in the midst of a storm, and keep flying in changing weather patterns. The danger is that the control line could break under the strain, leaving the kite to be blown helplessly away, and the ground to be blinded by the dusty whirlwinds that threaten to pull it apart.

Columbus

Urban Systemic Initiative Schools

Impressionistic Tale

Sigrid Wagner - The Ohio State University

Lantern Hill Middle School

Bridging the Gap: Equity in Systemic Reform

Lantern Hill is a middle school that "tries harder." Much of the tone of the school is set by the principal, a black female who exerts strong control while being extremely accessible to teachers and students. Visitors entering the front door of the school are greeted with a banner that trumpets "Lantern Hill: A School of Excellence." To the left is the principal's office, and the curtained glass wall is papered with newspaper clippings about the school, many of them reporting the success of the school chess team, which took first place in the state this year in the Novice class. On the wall just inside the waiting area are large bar graphs showing how much Lantern Hill students exceeded the Courthill and Ohio norms on the Metropolitan Achievement Test and the Ohio Proficiency Test.

Though I had an appointment to meet with the principal, Ms. Monroe, when I arrived she was "meeting with a class that's having trouble," so I sat down to wait. After about 15 minutes, I asked if I might go directly to the teacher's room where I was scheduled to observe next period, since classes were changing shortly, and I was assured that the principal would undoubtedly be in right after classes changed, and she would have someone escort me to the room.

It was at that moment that the principal strode briskly into the office, and after a hurried conference with the secretary, went to the P.A. console and summoned the teacher I was to meet with. As I was ushered into her office, she was chiding two students who had been told to wait in her office that, if they didn't care to work in school now, they could come for summer school if they preferred. She dismissed them to their class with a hall pass and then apologized to me for being late, explaining that the end-of-the-year syndrome was setting in already in early May.

I was reviewing for her the purpose of my visit when the teacher I was to meet with, Marie (one of three math Discovery teachers in the school and a participant in the first OSU summer math institute I taught in), appeared at the door to escort me upstairs. Ms. Monroe followed us out of the office and headed for the main hallway intersection to preside over class change.

My first impression of Ms. Monroe as an extremely strong influence in the school was reinforced by a number of observations throughout my site visit at Lantern Hill. Partly because of my own scheduling constraints and partly courtesy of the school's proximity to the OSU campus, the site visit was conducted over three days spaced throughout the month of May. Each time I was in the school there were incidents that occurred that confirmed my initial impression of the principal as an ever-present, very hands-on leader of the school.

On the first day, the second class I was to observe was canceled because Ms. Monroe was meeting with the group in the auditorium because "they were being difficult and causing lots of trouble in their classes." I was left to infer why she had chosen their math class period to meet with them—by the time I had an opportunity to ask her about it, I'm not sure she remembered the exact circumstances. She confirmed the general statement that they had been causing lots of trouble.

In retrospect, I wish I could have listened in on the session Ms. Monroe had with the troublesome class. At the time, it didn't seem appropriate, perhaps, for a visitor to sit in on a disciplinary session, and I'm not sure I would have been permitted to do so, had I asked. Instead, I used the time to visit the media center. Given my later impression that Marie, despite her

involvement in Discovery, used very traditional teaching methods, I couldn't help but wonder whether boredom wasn't a major factor in the class's misbehavior.

On the second day of the site visit, my scheduled interview with Marie was pre-empted by a meeting that Ms. Monroe had called with the 7th-grade instructional team that Marie was on. The secretary explained that the principal often sat in on the team meetings but that this particular meeting was one she had called herself. When I later asked Marie about the meeting, she said it was "just to make sure we weren't letting the kids slack off at the end of the year." Ms. Monroe subsequently confirmed that purpose for the meeting.

On the third day, my scheduled interview with Ms. Monroe was disrupted because she was working with the 8th graders as they rehearsed for graduation. We rescheduled the interview for later that same day, and she suggested we go to the media center to talk "so we won't be interrupted." As we walked down the hall, a student ran to catch up with us and started jivin' with Ms. Monroe. She jived right back, and there was no mistaking the mutual respect and affection between principal and student.

I was struck anew with what a powerful presence this principal was in the school. She was everywhere at once, constantly meeting or talking with both teachers and students. Though I didn't observe it firsthand, in our interview she talked at some length about the importance of parents and the amount of time she spends talking with them. I don't doubt for a minute that she spends considerable time talking with parents.

Ms. Monroe is the sort of person who seems to have no time for anything, and yet has time for everything and everyone. She is enormously proud of her school and her role in making it what it is. She was the principal who applied for the designation "School of Excellence" soon after coming to Lantern Hill six years ago.

She has total respect for students and teachers. She often commented on objective circumstances, such as end-of-the-year syndrome, but I never heard her make a disparaging remark about any individual person. She has very high expectations for herself and for others and successfully communicates those expectations to the entire school. She leads by example. Everyone in the school obviously feels pressure, but not coercion, to do their best and better.

Lantern Hill would make an interesting case study on the influence of administrative support on reform efforts in mathematics and science education. A neighborhood school with a working- and lower-to-middle class clientele (95% African-American), it certainly demonstrates the salutary effect that administrative encouragement and the positive attitude it engenders can have on both student achievement and teacher development.

It should also be noted that the relationship between participation in Discovery and the use of reform methods in the classroom is not, however, so clear-cut at Lantern Hill. Could this be because Ms. Monroe hand-picked the Discovery participants as those teachers who could most benefit from participation? I do recall that Marie was one of several institute participants who said she was there because "my principal said I had to."

The other teacher that I spent the most time with during the Lantern Hill site visit was not a Discovery teacher, but he spent significant amounts of class time on inquiry kinds of activities. When I asked him to talk about reform during the interview, he commented that he didn't consider the methods he uses as "reform" methods; rather, he teaches the way he himself was taught in school right here in Forest County. So, slow as it is, maybe as a profession we're making more progress than we sometimes think we are! His comment certainly attests to the importance of reform efforts not only for their impact on student achievement, but for their impact on future teachers.

Appalachian
Rural Systemic Initiative Schools

Impressionistic Tale

Mary Kay Kelly - Miami University
Anderson Junior High
Bridging the Gap: Equity in Systemic Reform

Demographic Overview

Population: *14,288*
Unemployment: *625 persons (11.0 %)*
Race:

White	*98.80%*
Black	*1.00%*
American Indian, Eskimo, or Aleut	*0.17%*
Asian or Pacific Islander	*0.03%*
Other Race	*N/A*

Median Household Income: *$21,180 (5,257 households)*
Median Family Income: *$24,455 (4,019 families)*
Median Home Value: *$44,400*

Poverty: Families below the poverty level.

11.7 % of two parent/married-couple	*(82.7% of families)*
33.3 % of male householder, no wife present	*(3.6% of families)*
39.0 % of female householder, no husband present	*(13.7% of families)*

Source: U.S. Government Census, 1989

Impressions of the Town

I arrived at the Comfort Inn in Pierce at about 5:30 p.m. It took about 2 hours to get here from the nearby major city where I live. It was a beautiful drive through the beginnings of the foothills of the Appalachians. As I approached, I began to see hazy hills in the distance, my ears began to pop and the road began to increase in grade and become more curvy.

After checking in to the motel, I drove into the town of Williamson to locate the school and get a feel for the town. The city of Williamson was much larger than I had anticipated. A state route runs directly through Pierce and Williamson, connecting two larger towns. Along the stretch of highway that bisects Williamson, there are several strip malls, fast food restaurants, gas stations and other local and national chain businesses. There is also a downtown area off both sides of the highway. Some of the corner buildings adjacent to the highway had been restored and had businesses within them, including what appeared to be a very nice restaurant.

The houses in the town seem small, compared to the standards of the suburban area of the nearby major city, but are well maintained with many old trees, beautiful blooming tulips, and manicured lawns. After locating Anderson Junior High, I explored a road to Willow Lake State Park. This was a beautiful winding drive back into an area around the lake. The lake seems too inhabited to be a state park. On the south side of the lake there are many beautiful homes that are close to the lake as well as on the bluffs around the lake. These homes are larger than the homes in town, but are certainly not like the mansions one sees around lakes in or around predominately urban areas. On the north side of the lake the road is close to the lake and the homes sit on the hill that rises above the road. The homes on this side of the lake are more modest and not nearly as

well maintained as those on the south shore of the lake. Many of these homes had old junk on the front porch or in the yard.

Impressions of the School

Just north of the center of town is Anderson Junior High, the only junior high in the district. Anderson Junior High is a small white brick building that appears to have been built in the late 1950's or early 1960's. It houses grades 6, 7, and 8 and there are roughly 160 students in each grade. The school has two hallways that run perpendicular to one another. Immediately inside the front door of the school the office is to the left and the gym/cafeteria/auditorium is to the right. A long narrow breeze way leads straight ahead to the academic corridor. Along this academic hall, eighth grade classrooms are primarily at the end of the hallway to the left, sixth grade classrooms are primarily at the end of the right hallway, and 7th grade classrooms are in the middle, some to the left and some to the right. Straight ahead, just past the academic hallway, is the nurse's office and a small teachers room and lavatory, followed by an exit that is used for physical education classes and recess.

Impressions of Reform: Inconsistent Efforts

The degree that teachers are buying into and using reform teaching techniques varies. All four teachers that I interviewed or observed have or are close to finishing their master's degrees, and each has a different approach to teaching. In mathematics, one seventh grade teacher is focused on being a giver of knowledge, while the other is focused on being a guide of thinkers. The former teacher, who teaches only the honors pre-algebra class of seventh graders, believes that in order for students to learn mathematics concepts, the curriculum should focus on basic skills and students should be given repetitive problems to practice these skills. He sees his primary responsibility as preparing students for the Ohio Proficiency Test. This teacher feels that students are not adequately prepared in the lower grades to understand the problem solving techniques he would like to teach them, and he promises that all students will at least know how to divide when they leave his class. He stresses individual work from the book and competition among students in his classes. He would like to see students have more opportunity to work at their own pace and feels that they should be grouped by ability in mathematics. He feels that this arrangement would benefit the more skilled students who would have the opportunity to go above and beyond the basic requirements. It would also benefit the less able students by giving him the ability to focus on their specific needs.

In contrast to this teacher's style, the other seventh grade mathematics teacher, who teaches all of the general mathematics classes, feels that her primary responsibility is to help students develop their ability to think. The lessons that I observed were inquiry-based and pushed students to develop their own understanding of the concepts covered and build their own theory through trial and error with the assistance of manipulatives. Her students were excited about mathematics and stressed the importance of working together to learn how to solve problems. This teacher does not neglect her responsibility of preparing students for the Proficiency Test and has developed weekly practice problem sets that the students complete and are quizzed on for a grade. She emphasizes how to solve problems with her students and requires them to explain the procedures they use to interpret and solve problems. This teacher feels good about her teaching and about how her students have progressed. This year her 8th grade students did better on the mathematics portion of the Ohio 9th Grade Proficiency Test than did the 8th grade students of the more traditional teacher discussed above. She feels that she is doing something right, but feels isolated as an innovator. She feels more space to practice her inquiry-based teaching style this year with the new principal, who is open to allowing teachers to try new things, but still feels that others in the building think she is not a good teacher because her classes are more noisy than many others as the students work in groups together. She is convinced that the use of inquiry is essential to student understanding and would like to see other teachers move more in that direction, but feels that the climate of the school does not foster collaboration among teachers.

As in mathematics, the use of reform teaching practices in science was inconsistent also. The eighth grade science teacher sees himself as a giver of knowledge, uses the text book extensively, day after day, and uses lectures as his primary pedagogical tool, while the 7th grade teacher often has students in groups doing activities. While the 8th grade teacher spoke of the importance of hands-on, activity-based learning and students' need to construct their own knowledge, his actions and the reports of his students indicated that he did not put these ideas into practice. His students report that they have only done 3 or 4 labs the entire school year. The teacher feels that he does not have the facilities or the equipment to do any more activities than what he has done. One project he was very proud of was the creation of a pond that his students were building on the school grounds. Students had studied many different aspects of ponds and pond life and were now creating their own pond from what they had learned. While this was an exciting project and tied together many of the topics that the class had covered during the school year, the project was not big enough for all seven of this teacher's classes to actively participate in. The first few periods of the day had much work to do in creating the pond, but by later in the day the physical work was completed and the afternoon classes spent time working from the book. In addition, a female student from an early class felt that because most of the work had involved digging, the girls had been excluded. They would go out during class time and watch the boys do the digging. She hoped that as they began to add plants and animals to the pond she would have more of a role to play.

Because the principal encouraged teachers to try new things, but did not offer time for teachers to share their ideas or results with one another, the implementation of reform teaching practices was inconsistent. The principal felt that it was not important or even desirable to have all teachers doing the same things or teaching in the same manner. However, there did not seem to be any standards in place to judge the effectiveness of new strategies outside of student performance on the Proficiency Test. The principal was patient, however, and felt it would be unfair to judge the effectiveness of new strategies before they had been in place for four or five years.

Impressions of Equity: Hidden Issues

When asked about equity issues in the school neither the principal nor the teachers had much idea about what to talk about. However, as I observed and asked questions, several equity concerns surfaced. One predominant issue was socio-economic status. This issue surfaced both in terms of the economic disparity between students as well as the low income level of the school in general. One teacher expressed her concern that the disparity between students was particularly a problem in the 8th grade where nasty fights between students of different backgrounds were not uncommon and often the student from the poor family suffered the worst consequences. The principal confirmed, this adding that each year there are more and more things that separate students. In addition, the teacher felt that disadvantaged students often did not have the same opportunities to learn as their more wealthy peers. She told me of an incident where a student with a high IQ who had passed the required entrance exam for the Talented and Gifted Program (TAG), but whose parents were "nobodies" was not admitted to the program because it was feared that she would not be socially accepted by the other students in the program. However, another student with a substantially lower IQ who had not passed the required entrance exam, but whose father was a prominent lawyer and judge, had been admitted. Her explanation was that the real requirement for acceptance into the TAG program was a student's birth certificate.

In terms of the school as a whole, economic equity is a recognized problem. Both the 7th and 8th grade science teachers commented on the lack of facilities to do laboratory work and the lack of funds to buy supplies to support a hands-on, activity-based curriculum. However, one teacher managed to pull together materials to do many activities while the other teacher was able to pull together materials for very few activities. Because of the lack of equipment to perform labs and teach in a more activity-centered way, this teacher expressed his concern about the proficiency test. While he thinks that the test is a good idea because it holds teachers and students accountable, he

also feels that if students and teachers across the State are going to be measured by the same instrument, then they should be working under equitable conditions. He feels that the lack of funds at Anderson place him and his students at an unfair disadvantage.

Another equity issue that was raised involved racial equity. While the population of the surrounding community is over 98% White, the few African American students at the school are practically invisible. While none of the teachers mentioned race as an issue, the principal indicated that there were reduced opportunities for African American students. He mentioned that few, if any, African American students participated in extracurricular activities because most of them lived far from the school. He told me that the district had previously had three neighborhood middle schools all of which had their own sports teams and extracurricular activities. These neighborhood schools were also close to where the students lived and transportation was not as much of a problem for the students and parents. In order to offer a better program, cut costs and eliminate segregation, however, the district closed two of the schools and left only one middle school. Because of the increased competition for places on sports teams and the distance that many poor and African American students lived from the school, many students who might have participated in extracurricular activities in the neighborhood schools were unable to participate at the new school.

Conclusion

My observations gave me a glimpse of what is going on in the classrooms at Anderson Junior High in Williamson, Ohio, but it was the interviews that allowed me to begin to uncover some of the important issues facing this school. First of all, I feel that the economic status of the school in general and the students in particular is a problem that will need to be addressed on many levels. How can the state find a more equitable way of funding schools so that there is not such a disparity in what kinds of programs schools can offer? Also, what kinds of policies does this district have in place to protect the educational opportunities of all students, regardless of gender, race, or economic status? Given that this community is predominantly White, how is racial identity in the Black community formed and protected? And, how is diversity awareness on a national and international scale handled in the classrooms? Another issue revolves around reform. What does a small district like this do to help teachers keep abreast of innovative teaching practices and how can they better support creativity and innovation in the classroom? What philosophy do teachers hold about how kids learn, about what they need to know, and about what the most effective teaching strategies are? All these questions point to possible areas of interest at Anderson Junior High. It seems to me that with a staff so small, much could be done to improve the quality of mathematics and science teaching in the building.

The Red-Headed Stepchildren

Impressionistic Tale

Steven Rogg - Miami University

Jackson Junior High School

Bridging the Gap: Equity in Systemic Reform

The Setting

As I drove into the area I was impressed by a sense of wilderness and timelessness. My mind readily imagined scenes of homesteaders taking their survival from the land; finding sport in hunting and fishing; and making entertainment by visiting neighbors, swapping stories, and making the occasional trip to town. These images are borne of the lush density of the woods, by the signs for hunting and sports clubs, by the winding lanes, and also by the names of occasional crossroads and towns—often suggesting local features of the landscape such as the hills and creeks they navigate.

So it is with Madison, a town nestled between the hills and the Ohio River. One has the sense of a historic settlement, which in its heyday was a locus of commerce and a gateway into the heartland. Today, however, the river is used for little more than recreation and for transporting coal. Only a secondary highway connects the town to larger communities. Still, if it weren't for this route, which includes an impressive old steel bridge spanning the river to West Virginia, one is left to ponder what might have been the fate of a community such as this.

The School's Physical Plant

If the town is timeless, so it seems are its schools. Jackson Junior High occupies a building which was constructed in 1936 to serve as the town's high school. The junior high was established there when a new high school was built approximately thirty years ago. A history of the county (ca 1949) published a photograph of the building confirming that it is virtually unchanged over the years. In addition to the old high school building, the junior high also utilizes a second and older building about 100 feet away which once housed elementary grades three through seven.

That the elementary and junior high schools share a campus very near the center of Madison suggests the central role that schools have held in the town. The grounds, for example, include a stadium which had been built with W.P.A. resources. Modest by today's standards, the stadium continues to be a point of pride for the community. Here is how one author described the campus in 1949:

> *Concerts, athletic contests, operettas, plays, and other school-provided entertainment are actively supported and welcomed by the community. Much of the success of these activities is due to our well-planned centralization of equipment, buildings, and grounds.*

While the elementary school is close-by the two junior high buildings, the "newer" consolidated high school now lies outside of town.

The grounds of the campus are neatly groomed. Other than the flagpole and a flower-bordered brick sign bearing "Jackson JHS: Where Spartans are Born," there are few landscape features. A gravel parking lot lies between the two buildings.

Inside, it is apparent that the buildings have been maintained, but never significantly remodeled or updated. In fact, one senior teacher who has been at the schools for 26 years, reported that nothing has changed during that period except the installation of one fire door. Layers of paint appear thick on walls.

The office is adjacent to the main entrance of the main building. Classrooms in this structure are arranged mostly around the outside walls of the downstairs and fill the second floor (accessible only by stairs). According to the principal, only a single phone line enters the building (I saw a repeater device on the office wall, apparently to allow limited multiple phone access). No internal computer network exists nor is there Internet/e-mail access. The center of the main building contains a small gymnasium and an auditorium where school convocations and performances for parents/community are held.

My impression is that Jackson JHS has state-of-the-art facilities—for 1936 (but not for 1997). Some sense of community may have been lost when the high school was moved from the town campus.

Science and Mathematics at Jackson JHS

In a conversation with a local resident who had graduated from the High School, I learned that the building once featured a dedicated science laboratory. However, it had been converted to a standard classroom facility when the building became the junior high. Both science classrooms I visited contained storage/display cabinetry on one wall. The outside walls are filled with windows with a chalkboard on the opposite "front" wall. The teacher's desk and wet lab bench for demonstration are positioned just in front of the chalkboard. Students' desks are arranged in rows, facing the front. Each classroom has an Apple™ IIe computer (now considered old technology) on a mobile cart. These were not in use during my visit.

The two mathematics classrooms I observed are visibly larger than the science rooms. These also have cabinetry for display and storage, chalkboard, and classic student desks. In one of the rooms students' desks are arranged in rows and in the other the desks are in groups of 4 to 6. The walls of the room with grouped desks are also decorated extensively with posters and inspirational messages, both commercial and original student work.

The equipment and the physical environment for science and mathematics teaching and learning leads me to strongly suspect that Jackson JHS would be considered significantly underprivileged. This is supported by the following comparison to 1996 reported total expenditure per pupil at this school with the state average.

	Reported Total Per-Pupil Expenditure, 1996
Jackson JHS	$3,894
Ohio average	$5,545

During a group interview with teachers and the guidance counselor, I also learned that the school has no developed community or local business/industry involvement other than the local grocery store. The teachers and guidance counselor had several ideas, including support from the power industries, getting used computers from businesses, and applying for grants from foundations, but there are no active efforts underway.

Moreover, more than one teacher shared how disheartened they are that attendance at Parent's Night typically attracts fewer than 30% of families. Yet, I was also unable to identify the parent's role in formal education at Jackson JHS. In the principal's words,

The parents—that's really a double edged sword sometimes...you don't want to have parents discourage their kids, [and] sometimes they don't see the relevance of someone continuing on or somebody doing something. By the same token it could be positive, but it could be on the negative side as well.

Thus, the school has not much assistance from parents or businesses and its teaching staff is the primary resource the school has for providing outstanding science and mathematics education. Remarkably, its teachers' average salary is well below that of Ohio.

	Salary	Experience
Jackson JHS	26,108	12.0
Ohio average	38,064	14.8

Jackson JHS has made a major changes to improve the learning by students. It abandoned a 9-period day, eliminated study hall, and established student cohorts within teacher teams. This structure is promoting stronger relationships among teachers and between students and their teachers. In addition, teaming has resulted in a more coordinated curriculum (within teams), which has made teaching both more efficient and effective. For example, students within a team cluster have identical homework assignments since they share content-area teachers. Teachers report that they have covered more material this year than in the past.

Teaching styles vary widely among the staff, ranging from expository to "hands-on." Both teachers and administrators see this as "strength in diversity" within the team context. In fact, teams were intentionally formed to be heterogeneous by teaching style. My impression is that an investment in high quality professional development, sustained over time, may be particularly effective for improving student achievement in schools which depend so fully on their teachers.

Conclusion: The Red-Headed Stepchild

I was first introduced to the expression "red-headed stepchild" by the school's guidance counselor, when he said to me: "As you know, middle schools are the red-headed stepchild." What could this mean? Perhaps, I thought, it was to suggest that while elementary schools and high schools enjoy community attention, the middle grades, he felt, are largely ignored.

A day later, during my evening meal at a local diner, I was struck to hear the same expression in a conversation between two waitresses. One was telling the other that should she find her tip missing from one of her tables, she would "beat [the other] like a red-headed stepchild." I couldn't help but consider this as metaphor for what I had seen and heard during my visit to Jackson JHS.

Impressionistic Tale

Mary Kay Kelly - Miami University
Peterson Elementary School
Bridging the Gap: Equity in Systemic Reform

Demographic Overview

This demographic information may be misleading because it was obtained through the use of a zip code which also includes a larger town that is **not** served by the Local School District and Peterson Elementary School. This larger town has its own school district. Local School District and Peterson Elementary serve the more rural portion of the county west of the larger town.

Population: *4,259*
Unemployment: *226 persons (13.6%)*
Race:

White	*99.50%*
Black	*.25%*
American Indian, Eskimo, or Aleut	
Asian or Pacific Islander	*.23%*
Other Race	

Median Household Income: *$19,289 (1529 households)*
Median Family Income: *$24,340 (1195 families)*
Median Home Value: *$41,900*

Poverty: Families below the poverty level:

16.5 % of two parent/married-couple	*(76.1 % of all families)*
35.5 % of male householder, no wife present	*(5.2 % of all families)*
46.0 % of female householder, no husband present	*(18.7 % of all families)*

Source: U.S. Government Census, 1989

Impressions of the School and Community

The fear of ruining the soles of my new black pumps on the gravel teachers' parking lot at Peterson Elementary School was my first indication that I was entering a school unlike any I had seen before. I was leaving the familiar manicured lawns and paved parking lots of suburban schools where students live on cul-de-sacs in middle class subdivisions with municipal pools and sidewalk-lined streets and entering a world where schools have gravel parking lots, serve students from an area covering many square miles and where some students live in lone trailer homes perched on hillsides adjacent to rural highways and other students live in unseen homes off the unpaved roads, hidden in the hollows of the forest. Peterson Elementary School was in such a community.

Local School District, which serves the rural, western portion of Pierce County, consists of two schools, Peterson Elementary School and Lewis High School. There is no real physical center to the community that is served by the Local District, although a few houses and businesses are clumped together off of the highway in the vicinity of Lewis High School. The population of the school district was 4,259 in 1989, and the district is in the process of building a new high school that will house students from grades 7 to 12.

Just over 600 students currently attend Peterson Elementary School from pre-Kindergarten to seventh grade. From the teachers' parking lot one enters the primary wing of the building which is cheerfully lined with student drawings, paintings, projects, and photographs. Both the primary and intermediate wings of the building are similarly merry. The junior high wing, which houses the sixth and seventh grades, however, is painted bright white and has only a few bulletins announcing a cheerleading clinic and practice schedule to interrupt the glare of the lights on the barren wall. The school is currently overcrowded with eight or ten portable classroom units. The overcrowding should ease next fall when the seventh grade is moved to the new high school building.

Impressions of Equity

"How come we have computers and stuff, but we don't got a football team?" (female student, classroom observation 5/21/97). This student's remark seems to get to some of the issues relevant to small, rural communities that have to make choices about where scarce human and financial resources will be spent. Peterson Elementary School can be described as a prosperous, compassionate school serving a small, needy, rural community. The school is located in a poor, rural area with a small property tax base, average parent income of just over $16,000 annually and about 65% of the students receiving free or reduced lunch. The school itself and the district, however, have taken advantage of any external financial resources available. Mr. Moore, the principal of Peterson, remembers a time when the district "didn't have two nickels to rub together" and was in financial debt (Moore interview 5/22/97). However, he credits the superintendent with utilizing money distributed by the State of Ohio to poor schools in the 1970's and lottery money to raise teacher salaries, purchase supplies and, most importantly, to invest in the future. As a result of this investing the district is in a good financial position. Mr. Moore told his teachers that they will get whatever supplies they request and will each be given $250 in the fall to purchase other supplies for their classrooms. In addition, the district is in the process of building a new school that will house grades seven through twelve.

In addition to good financial decisions being made at the district level, Mr. Moore has been instrumental in finding all the grants and funds available to Peterson. The school has benefited from Goals 2000, School Net and School Net Plus moneys and currently has a small computer lab in every classroom. Moore is pleased that the State of Ohio recently ruled that school funding is inadequate and inequitable, but does not believe in the "Robin Hood approach - stealing from the rich to give to the poor" (Moore interview 5/22/97). He indicated that the state will have to figure out a way to help the poor schools financially without taking funds away from the more affluent districts.

The financial security of the district does not reflect the financial position of the students who attend Peterson. Mr. Moore described the plight of many of his students:

> *In any poor area you're going to have [social issues to deal with], because [many students come from homes where there is] no running water, the parents are still asleep when the kids get up to go to school, the kids wear dirty clothes two and three days, [and] they have body odor. And so to help these kids feel good about themselves, we have to take care of these problems first. (Moore interview 5/22/97)*

Mr. Moore feels that his school should provide its students with opportunities that they would not have otherwise. For instance, he is sold on field trip experiences. He claims that if it were not for the trips students take with their school, many would never have the opportunity to leave Pierce County. For this reason, Mr. Moore supports as many field trips as possible. Students go swimming in a nearby state park, make trips to museums in nearby small towns and by the time they are in fifth grade, every student has had the opportunity to travel to the nearby major city to hear the symphony. Says Moore, "Anytime they can see something outside their own community it

teaches them that there are other things out there besides just Pierce County and they should go and try to make something of themselves" (Moore interview 5/22/97).

Impressions of Reform

Reform is an ongoing part of life at Peterson. Teachers are encouraged to attend local and state conferences, to take advantage of continuing education opportunities, and to become content area experts. Mr. Moore believes that change must ultimately come from the teachers themselves. "We can dictate to them and have the best program out in the market, but if the teachers aren't sold on it and you try to cram it down their throats, they're going to prove you wrong" (Moore interview 7/22/97). Mr. Moore feels that his role is to support the programs that the teachers are sold on. He does not personally keep up on the standards in each content area, but expects his teachers to do so. As a result of this belief, the school is in the midst of implementing changes, or reforms, in its mathematics program.

Student scores on the Ohio State Proficiency Test and achievement tests have indicated that Peterson's students are seriously lacking in mathematics skills. Because of these low test scores and with the high percentage of economically disadvantaged students who attend Peterson, the school qualified to use Title 1 funds on a school-wide basis rather than to assist specific, identified disadvantaged children. The teachers and principal decided that the funds would be used to reduce class size in mathematics by dividing the sixth and seventh grade classes for mathematics instruction. This meant that while an English, social studies or science teacher may have twenty seventh graders in a class, the mathematics teacher may have eight or ten seventh graders in a class. The students are placed in mathematics classes according to their ability. One teacher teaches the more advanced students and those working at grade level while the other teacher teaches the students who need more direct assistance.

In addition to reducing class size by tracking students, the mathematics teachers researched and selected a new mathematics program. This year the sixth and seventh grade classes piloted the Saxon Mathematics Program. The teachers are so impressed with the program and the students' progress that they have purchased the comprehensive program for the entire school, grades one through seven. While both seventh grade teachers I interviewed had been through a Discovery Institute, both still felt that the repetition the Saxon program provides will best meet the needs of their students. They feel that the program is aligned to the NCTM Standards, the Ohio Model Curriculum and the Ohio Proficiency Test requirements. At the end of the first year, both teachers feel that they can see substantial improvements in the achievement of their students and are looking forward to seeing this year's standardized test scores.

While these changes are contrary to what might be considered reform aligned with the national standards, the teachers and principal at Peterson Elementary School feel that they are doing what needs to be done to improve the mathematics achievement of their students. While the first year of the Saxon Program implementation was very rigid and included virtually no inquiry activities, both teachers felt that they would be able to supplement the program with such activities as they become more comfortable with teaching the new program. My impression is that the pressure to improve Proficiency Test scores is so great that teachers have abandoned the hope that they will be able to help students understand mathematics concepts and have succumbed to the hope that scores will improve if they can help students memorize mathematical rules.

Non-Systemic Initiative Schools

Impressionistic Tale

Mark H. Brooks Hedstrom - Miami University

Daniel Miller Junior High School

Bridging the Gap: Equity in Systemic Reform

Daniel Miller Junior High is a school facing many challenges, including huge numbers, quickly changing demographics (a rising number of minorities), and many students in foster care or receiving public aid. Many schools in this situation decay into a constant state of crisis, but Daniel Miller has risen to meet the challenges. The school has adopted several battle strategies, some traditional (e.g. student uniforms, restricted passing periods) and some not (e.g. schools within the school, manipulatives in math). All those strategies which are not traditional can be called reform, but I came away from my site visit with the distinct impression that all these reforms are working within a very traditional framework, a framework of control.

To justify this claim I will first recount some of the choices that different reformers and potential reformers have made at Daniel Miller, and then I will note patterns in those choices and discuss what those patterns suggest.

Discovery Focus Teacher

Mrs. Pamela Fisher, the white Discovery participant Focus Teacher, adopts many reformed teaching methods, such as use of manipulatives, use of group learning, and emphasis on understanding the reasons behind the procedures of math. Some of these methods allow for more classroom noise and less centralized attention than traditional methods, and she accepts these consequences. But Fisher has definite limits on how much loss of control she will accept for the sake of reform. In my three days of observations she did not rely on students to discover mathematical principles, nor did she pursue and validate alternative ways that students thought about math problems. The traditional classroom roles of teacher and student were never in question. Control over the classroom, control over the activities, and control over the material always resided with the teacher. These are the choices that Fisher has made, picking the elements of Discovery that she deems appropriate in her situation. These are the sorts of choices that any professional has to make, intuitively weighing pros and cons in a specific situation.

Principal

The principal's focus on reform has primarily been within the context of the middle school movement. Principal Jeff Smith, an African American, has instigated a family structure (5 families of approximately 125 students apiece), a more proactive guidance department, interdisciplinary and team teaching, intervention for those students who are struggling in proficiency subjects, and an increased focus on state strands and proficiency tests. His choices, for the time being at least, only challenge the traditional roles of teacher and student in terms of the amount of nurturing that is possible. He wants to make the 7th and 8th grades more similar to the elementary school experience in this regard. When asked about reform he does not focus on constructivist teaching methods or on repositioning the locus of control in the classroom. He also does not mention the uniforms or the restricted passing periods (no talking, and lockers only during select passing periods). His choices represent his professional judgment of what is best for this school.

Disavowed Discovery Teacher

There were several Discovery teachers at Daniel Miller, most of whom I did not get a chance to interact with. I learned that one of them has "totally rejected Discovery teaching," according to an informal conversation with another Discovery teacher. "You go into her room and you can hear a pin drop." What made her reject Discovery teaching? What were the issues, and in what priority, that bore upon her decision? I do not know the answers to these questions, but I do know that her decisions result in a much more controlled classroom.

Control, Evolution, And A Vision For Future Change

The choices made by reformers and non-reformers here are very similar to the choices made by a military general in a battle situation. The general may choose innovative methods or technology, but he will be selective, making choices based on, among other issues, his need to have total control of his forces in difficult situations. In the same way the agents of reform at Daniel Miller have selected from the many means of reform those strategies that will not jeopardize control of students. Fisher represents this attitude well, but it is also very evident in the choices of the principal, and even in the choices of the one Discovery teacher who has rejected Discovery methods.

And while control is a central issue here, I do not see it as the primary objective. Fisher, a self-described "control-freak" who grew up with a father in the Marines (a fact that she shared when describing her attitude towards control), has evolved in her teaching methods to allow more freedom in her classroom. It is clear that good teaching is her primary end, and control is a means to that end. She credits Discovery in helping her in this evolution, and I did not get the impression from her that she is done evolving.

While Fisher did not express a specific vision for future change, there were other individuals who gave me a feeling for their visions. Judy Walters (another Discovery math teacher) expressed an interest in finding a Discovery institute for this summer that would be geared to past participants. Before going to her first institute she felt that she did not have anything more to learn about math teaching. Even with close to 30 years of teaching she is now interested in learning more about new ways of teaching math. Principal Smith shared with me his vision for a less structured daily schedule—doing away with bells to allow teachers to focus on particular subjects as they feel necessary.

It is not clear to me whether the change agents at Daniel Miller will be able to bring themselves to try reforms that will require loosening the grips of control. At present there is not a feeling of crisis at the school that might provide stronger motivation for radical moves (proficiency scores and attendance rates are both acceptable). But perhaps it is the absence of a crisis that will allow for experiments that put more trust in the students.

Reform And Equity

Beatrice Clawson (our non-Discovery Focus Teacher, an African American), is seen by the principal to be an excellent math teacher. When asked what she would say if given a voice about education reform, she shared a vision that also spoke to her views on equity. She said that if she could push for one change in education she would require at least six guidance counselors in every elementary school. She felt that too many children, and a disproportionate number of African American boys, mentally drop-out of school because of a lack of nurturing at home. At the junior high level it is almost too late—these students have a low self-image and never expect to be able to achieve academically. She feels that it must be at the elementary level that troubled students are identified and given the counseling they need.

Attendance data can illustrate the troubles of African American boys, as well as boys in general. In Fisher's Bell 1 class there were 18 girls (17 African American, 1 white) and 7 boys (5 African American, 2 White), and in Clawson's Bell 3 class there were 17 girls (11 African American, 6 white) and 9 boys (8 African American, 1 White). The school is 73% African American and 25% white, which I can guess is representative of the community. While I don't have data at hand, the principal did indicate that the student body is noticeably more than 50% female. I would guess that this is not representative of the community, and so there is a significant portion of males who are not attending school for one reason or another. This, to me, is the biggest equity issue impacting Daniel Miller Junior High at this time.

It's Better to Fly

Impressionistic Tale

Michael T. Battista - Kent State University

Lafayette Middle School

Bridging the Gap: Equity in Systemic Reform

I'm sitting in Pam Smith's classroom in Lafayette Middle School. Typical of old multi-story brick school buildings, it has light fixtures hanging from high ceilings and several tall windows filling one wall. Despite its age, however, the room seems modern and cheerful. The furnishings and equipment are new. (Financial support for the purchase of school equipment is high in this small well-to-do suburban community.) There's a current model Macintosh computer at each of the ten student tables. Another computer station at the front of the room is connected to a very large current model TV so that actions on that computer can be made visible throughout the room. There are student-made polyhedra hanging from the light fixtures and mathematical posters on the walls.

I've just completed my interview with Pam and am waiting to observe her next class as she makes some last minute preparations. The class will be UCSMP[1] Geometry. In the Lafayette Middle School program, students are homogeneously grouped—the eighth-grade students in this class are one year ahead of their on-level peers who are taking UCSMP Algebra.

I'm wondering what the class will be like. I've worked with elementary teachers in the Lafayette school district for a number of years. Its administrative team, from the superintendent on down through the principals and an extremely well-informed and exceptionally capable curriculum director in mathematics, are interested in and supportive of mathematics education reform. For instance, when the NCTM *Curriculum and Evaluation Standards* were first published, Lafayette's previous curriculum director distributed copies to all the districts' mathematics teachers. At the time of my visit, the district was in its first year of adoption of the *Investigations in Number, Data, and Space* program, the most reform-oriented, inquiry-based elementary mathematics curriculum currently available commercially. Also, the district has consistently attempted to keep its teachers up-to-date on pedagogical reform by involving them in inservice programs. For instance, several of the middle school's mathematics and science teachers had participated in *Project Discovery*, Ohio's NSF-supported state systemic reform initiative in mathematics and science education. Other teachers, like Pam, have regularly participated in other inservice programs sponsored or supported by the district.

However, I know from discussions with various school personnel that mathematics education reform in Lafayette's middle and high schools is not as far along as that in the elementary schools. For me, this is confirmed by their use of the UCSMP textbook series. In my view, this series is not completely consistent with the NCTM *Curriculum and Evaluation Standards*. UCSMP textbooks give students ready-made mathematical concepts and procedures that they are to learn and be able to apply, rather than let students create their own personally-meaningful concepts and procedures. Essentially, it is traditional "show and tell" coverage of mathematics—the type of instructional approach that has been shown by research to produce effective (but less than optimal) learning in only the best of students.

My earlier interviews with several of Pam's students corroborated my belief that the instruction I was about to observe in this class would be disappointingly traditional. Ted, for instance, said,

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[1] University of Chicago School Mathematics Program

We do the same thing every day. We do our homework, then we go over it in class, we do our homework, and go over it. Very rarely do we ever like go over it before we do it so we know how to do it.... I like seeing stuff instead of just the book. Like science class I learn a lot because of the experiments, but we don't do them here.

And Rich commented,

We usually get a good understanding of what the lesson was about. We do go over it well. But when we start we really don't know what we were doing because we don't go over the next lesson before we do the homework on it. [This is the UCSMP approach.] And we usually don't do that much stuff like hands on or anything. We just do it for homework and turn it in the next day. We don't do computers really that much—it's just like all paper.

My conversations with Pam's students suggested something of even greater concern. Although they are very bright—otherwise they wouldn't be enrolled in a high school geometry course in 8th grade—many were suffering the same fate as most students in traditional mathematics curricula. Mary, for example, said that she really understood geometry this year. However, to justify her claim that the volume of a box can be found by multiplying its length, width, and height together, Mary stated "because you are covering all three dimensions, I think. I'm not really sure. I just know the equation." Mary, like most students taught in traditional mathematics curricula, was willing to accept and utilize a formula she did not understand. Lindy, when asked if she really understood what was being taught in mathematics class, responded,

Not really. Geometry is not one of my strongest courses in mathematics. I just don't get it. In class, you just got to figure it out for yourself more than actually going through the lessons and doing all the problems together. We've done that once or twice. But that really helps in understanding it if we just go through and do all the problems together and explain how to do each one as we go along.

Lindy still believed that others had to show her how to do mathematics. She had not developed the intellectual autonomy that proper learning of mathematics bestows.

My interview with Pam, although strengthening my expectation that I was about to see a fairly traditional lesson, provided me some insight into how Pam viewed the reform movement in mathematics education. Pam told me that when the NCTM *Standards* first came out,

it made me want to get away from drill and practice for its own sake. As a result, I went away from pure drill and practice to having students explaining mathematics out loud to each other and to me, showing me that they really understand something.

Another change she cited was technology—students in her classes are never without a calculator:

That means you can ask different questions, you don't have to worry about the size of numbers any more, that answers don't come out even is not a concern. We also have a set of graphing calculators for every 8th grade teacher.

However, although "computational skill is not the main focus, computation is a definite skill students must have."

Pam also noted that one reason she liked using the UCSMP series was that she liked

getting more math to the kids when they can handle it. I have always thought that the 7th and 8th grade mathematics curriculum across the United States is watered down... I like teaching something new. The students are far more interested in math since we switched to the Chicago program. We used to get "Why do I have to do this? We did that last year." We don't get that anymore.

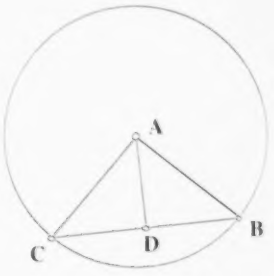
(There is a clear focus on applications of mathematics in the UCSMP series.) Pam said that with UCSMP, students "enjoy learning. They enjoy being treated like people who can understand something." Her view of Lafayette's ambitious mathematics curriculum was consistent with, maybe even demanded by, parental expectations:

> *We have a community where both parents work, both parents are college educated, they are career people. Many of them have professions that also involve a lot of mathematics. We want to prepare our students well for college, since the majority of our students go on to college. Our kids are interested in math and we want to make sure we give them everything they are able to handle.*

My interview evoked a different picture of Pam than I had developed by talking with her students and thinking about the textbook series she was using. Pam is a dedicated and caring professional. She is extremely enthusiastic about teaching mathematics and working with students. She has kept abreast of developments in her field by reading professional journals and attending conferences and workshops. The focus of our discussions was always on students' learning; there were no complaints, just a genuine dedication to helping all her students learn as much mathematics as possible. She seemed quite proud of the middle school mathematics program that she quite obviously played a role in forming. My opinion of Lafayette Middle School's mathematics program had gone up a notch.

As students started coming into the classroom, I moved to the back of the room. Pam—cheerful, relaxed, and enthusiastic—greeted students as they entered. Once some administrative matters were dispatched, Pam's geometry lesson began.

Pam: *I want you to make a circle in the Geometer's Sketchpad [a dynamic geometric drawing program for the computer]. Make a radius and measure it. [Once constructed, students can change the radius of the circle by moving the mouse pointer. When they do this, the measure is continuously updated.] Make a chord for the circle that has one of its endpoints the radius you drew. What's a chord?*



S: *It's a segment in a circle.*

Pam: *Is that all?*

S: *The endpoints have to be on the circle.*

Pam: *Now draw the radius to the other end of the chord. Tell me all the ways you could find the length of the chord.*

S1: *Measure it [in the GSP].*

S2: *Make a right angle with the radiuses and use the Pythagorean theorem.*

S3: *Use sines and cosines. But you need a triangle.*

Pam: *If each radius is 3, what is the length of the chord?*

Several student pairs use the Pythagorean theorem to find the length. Some check by measuring in the GSP. Pam confirms the correct answer.

Pam: *Make the radii at 120°. Now tell me the length of the chord without measuring it.*

After the students work cooperatively on the problem for a couple of minutes, Pam asks how they solved it.

S4: *Draw a median to the base, then you have a right triangle. Then find the measure of DA over the tangent of 30°. Then you multiply by 2 because that's just half the chord.*

Pam: *How do you know its a right triangle?*

S4: *There's a theorem somewhere.*

Pam: *What theorem? [Several students describe relevant theorems.] Did anybody measure to see if the theorem really works in this case? How do you know this theorem is true? What were all the names we found for the line of symmetry drawn to the base of an isosceles triangle?*

Ss: *Median, altitude*

Pam: *Right, and angle bisector. So it's perpendicular because of the isosceles triangle.*

Pam: *Okay, now how does your solution proceed [writing responses on the board and getting inputs from students]? We have a 30-60-90 triangle, so what are the other sides [one side = radius = 3].*

Ss: *3/2, 3/2* $\sqrt{3}$.

Pam: *Okay. So the chord is then* $3\sqrt{3}$. *What if the radius is 4?*

Ss: *[After changing their GSP sketches]* $4\sqrt{3}$.

Pam: *How about if it's 5?*

Ss: *[After changing their GSP sketches]* $5\sqrt{3}$.

Pam: *So it's r times* $\sqrt{3}$. *Now let's make it harder. What if the angle between the radii is 70°, find the length of the chord.*

Kay: *[After students work at their seat a few minutes] You divide 70 by 2 to get the angle in the triangle. Then take the sine of 35° times r because it's the hypotenuse. Then you multiply by 2 because there are two triangles. [Pam records Kay's method on the board. The other students ignore what Pam says next as they are busy trying Kay's method on their own computers.]*

Pam then goes on to have students use the GSP to investigate the relationship between inscribed and central angles of circles.

Pam's lesson was not at all what I expected! And ever since I observed it, I've been stimulated to think about a number of critical issues in mathematics education reform. On the one hand, Pam's lesson was a nicely sequenced investigation of geometric concepts. Most of the students seemed engaged. Students solved the problems that Pam posed by talking to partners, using previously learned concepts, and manipulating the *Geometer's Sketchpad*. I was quite impressed not only with what Pam's students were able to do mathematically, but with her obvious skill as a teacher. She had just demonstrated a textbook-perfect example of the time-honored pedagogical device known as Socratic questioning. I was starting to think of Pam as a "master teacher." My opinion of Lafayette Middle School's mathematics program had gone up a couple more notches.

On the other hand, for me, Pam's lesson, but even more her course as represented by UCSMP Geometry, is inconsistent with the problem-centered, inquiry-based, "constructivist teaching" that I, as a research-based mathematics educator, have come to believe in. The course focuses on

having students acquire and be able to use a predetermined body of traditional mathematical knowledge rather than on developing students who make personal sense of mathematical ideas. Even in this lesson, Pam was the mathematical authority. The students were not deciding, on their own, what was true or valid. Although the dialogue was lively, it was a dialogue between students and "teacher-as-mathematical-authority," not between students. Although Pam's students were solving genuine mathematical problems, they were not afforded a full opportunity to investigate geometry as independent sense makers. I wanted to see the students work on the problems that Pam gave, puzzle over them, discuss them, and eventually come to their own consensus about answers and general conclusions. This would have produced a much richer classroom discussion, and it would have permitted the students to develop their own personally meaningful mathematical ideas.

On the other hand, Pam had used technology appropriately and was experimenting with cooperative learning. Clearly, many of Pam's students had learned and were able to apply a significant amount of geometry. In the evolution of my thinking about mathematics education reform—which has included numerous successful experiences with reform mathematics and scores of exposures to the devastating personal toll that traditional teaching levies on the educational achievement and self-esteem of students of all ages—had I fallen into the trap of considering as completely ineffective all mathematics programs that do not meet my reform criteria? Just because Pam's geometry course was inconsistent with my paradigm didn't mean it produced no worthwhile student mathematics learning; there was much about the course worthy of praise. Perhaps research that has made a black-and-white distinction between traditional "teaching-as-telling" and "inquiry-based" instruction has blinded us to the fact that, in certain circumstances (which certainly have not yet been sufficiently investigated), teaching-as-telling—as implemented in UCSMP—may have some useful role to play in promoting meaningful mathematics learning.

I felt obligated to reconsider my previous analysis of the UCSMP series and Lafayette's middle school mathematics program. As I reread portions of the *Standards*, I had to concede that Lafayette's increased use of technology, greater focus on applications and connections between topics, more ambitious curriculum coverage, and less focus on proof in geometry are all consistent with reform tenets. Even the school's homogeneous grouping scheme appears to be consistent with NCTM recommendations because all students are being exposed to a curriculum suggested by the *Standards*: "We challenge teachers and other educators to develop and experiment with course outlines and grouping patterns to present the mathematics in the *Standards* in a meaningful, productive way." Lafayette had indeed made considerable progress toward reform[2].

However, there was still something essential missing. Lafayette's program lacked what should be the guiding principle of reform, an enlightened conception of school mathematics and mathematics learning. As the chairperson of the committee that wrote the *Standards* has stated,

> *The single most compelling issue in improving school mathematics is to change the epistemology of mathematics in schools, the sense on the part of teachers and students of what the mathematical enterprise is all about. The notion that mathematics is a set of rules and formalisms invented by experts, which everyone else is to memorize and use to obtain unique, correct answers, must be changed.*

Furthermore, according to the National Research Council, it is the inconsistency of traditional behaviorist-based teaching methods with the now scientifically-established constructivist view of mathematics learning that is at the root of the problem in mathematics teaching, "Research in learning shows that students actually construct their own understanding... Much of the failure in school mathematics is due to a tradition of teaching that is inappropriate to the way most students learn."

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[2] The changes that Lafayette had made are ones suggested in the body of the text of the *Standards*. The "spirit" of reform is described mostly in the introduction, and, indeed, in other publications.

Days and weeks after my visit to Pam's class, related questions and issues were still circulating in my mind. Exactly how much room for improving Pam's students' mathematics learning is there and precisely what instructional program can be used to accomplish this improvement? How can I convince Pam and her colleagues, who have accomplished so much—and who have so much to lose in their high-stakes game of maintaining parental support for their program—that there's still significant room for improvement in their students' mathematics learning? Indeed, because Lafayette's mathematics program is so successful—students do very well on the state mathematics proficiency test, all standardized tests, college entrance exams, and college admissions—there is a tendency for its teachers to feel that their program is reformed as much as it needs to be. After all, the ultimate goal of the reform movement is to increase students' poor performance in mathematics, and it is difficult for many to imagine how Lafayette's student achievement levels can be improved. In fact, with Lafayette's mathematics achievement levels so high and current standard measures of achievement misaligned with the goals of reform, there is a high probability that substantive change in the curriculum might decrease student achievement as indicated by these measures. How can I as a researcher demonstrate to teachers and parents—individuals who are not researchers in mathematics education—the improved mathematics learning that can result from a more advanced reform curriculum, given that many of the improvements are complex and difficult to measure?

I feel compelled to return to Pam's classroom for an extended period of time to figure out exactly what geometry her students are and are not learning. I need to observe her class extensively and conduct numerous interviews with her students to discover how they are constructing knowledge of geometric ideas. I want to discuss whatever I find with Pam, get her interpretations, and cooperatively consider implications for mathematics instruction. Such collaboration would help both Pam and me better understand how best to implement mathematics education reform in Lafayette Middle School.

However, even though seeing Pam's class has forced me to clarify and extend my thinking about reform, I am convinced as much as ever that her students' learning of mathematics can be improved. I have seen how students in her district can learn mathematics in a classroom that is completely consistent with an inquiry-based constructivist approach to teaching. And this experience has profoundly persuaded me that, although Pam has her students running fast in their pursuit of mathematical knowledge, with a change of paradigm, she could have them flying, soaring unbelievably high in their development of powerful mathematical reasoning.

Impressionistic Tale

Sigrid Wagner - The Ohio State University
Macon Junior High School
Bridging the Gap: Equity in Systemic Reform

Macon Junior High School is a study in contrasts. The physical facilities are old—as so often happens, the middle school took over the old high school building when the "new" high school was built—and the overall academic structure is traditional in that teachers have not been explicitly organized into interdisciplinary teams, yet students are benefiting from instructional methods that reflect many reform recommendations and a regard for female equity so strong that it has prompted concerns about unequal opportunities for boys.

[Because I visited both Lantern Hill Middle and Macon Junior High schools last spring, I could not help but notice contrasts between these two schools, and because I visited Lantern Hill first, it became my reference point. Thus the points of contrast I saw between the schools are discussed here rather than in the Lantern Hill "tale."]

MJH contrasts sharply with Lantern Hill Middle School in several important respects, even though both schools serve a working- and lower-to-middle class student population. MJH has an African-American minority enrollment of only about 30%, in contrast to 95% at LHMS, and Marksville (though officially a city) has a decidedly small-town atmosphere compared to the urban environment of Courthill.

From the standpoint of the school itself, the first contrast I noticed was the relative (in)visibility of the MJH principal compared to the omnipresence of the LHMS principal. For starters, all arrangements for my visit were made directly with the Discovery teacher who was the Bridging contact person at MJH, Barb Arnold, so I had not even spoken with the principal, Mr. Shakes, before my visit. When I arrived at the school, all entrances to the building seemed to be from the sides of the building, the main front entrance having been closed off years ago. I entered from the side door closest to the parking lot and followed signs to find the principal's office, the door to which was no different from any other door along the second floor hall. Mr. Shakes was in a meeting, so the secretary suggested I go directly to Barb's classroom. She asked a student who happened to be in the office at the time to take me upstairs to Barb's room on the third floor. I didn't end up meeting Mr. Shakes until the second day of my visit.

The contrast in the extent to which Barb's teaching and Marie's teaching (at LHMS) reflect principles of Discovery was notable indeed. Barb and Marie both participated in the same mathematics institute that I co-taught at OSU in the summer of 1992, so their exposure to inquiry activities was essentially the same, though they often worked in different groups so the ideas generated could have varied significantly. Five years later, Barb's teaching (except in her eighth grade algebra class) replicates many features of the Discovery mathematics institute (no text, all kinds of problem solving, small group work, peer teaching, etc.), whereas Marie's teaching (so far as I observed and she described it) reflects almost none of these features.

There could be many explanations for this contrast. For example, Barb is high school certified and was one of the strongest students in the 1992 Discovery cohort, whereas Marie is elementary certified and was one of the weakest students. Inferring from their interviews, there were probably noticeable differences between Barb's and Marie's teaching styles before the Discovery institute, and their institute experiences could have reinforced these differences, minimized them, or left them largely unchanged. Or, as will be discussed shortly, the difference in administrative styles in the two schools might possibly explain some of the contrast in the teachers' teaching styles.

On the first day of my visit, Barb's "free" period was devoted to a final check on the last issue of the school newspaper, which she advises (even as a math teacher), so I went to the computer lab and watched students work independently on a wide variety of software, much of it self-paced and self-administered to accommodate a range of abilities and interests. I stayed in the computer lab for the following period as well to observe a meeting of the school chapter of WISE (Women in Science and Engineering). A dozen retired female scientists and engineers (sponsors) converged on the computer lab to work one-on-one for an hour with a dozen female students (trainees) interested in careers in science and engineering. Each dyad was working on a different sort of problem, and activities ranged from finding resource materials on-line to computer modeling and data analysis. It was clear that very positive mentoring relationships had been established between the retirees and the young adolescent girls. Later that day I asked Barb if there was a similar opportunity for boys at the school, and she said, no, but that the question had been raised by parents and maybe something would get started. As it turned out, it was this very issue that provided some insight into the administrative style at Macon Junior High School.

On the second day of my visit, Barb gave me a tour of the school during her free period, and it was then that I met Mr. Shakes, who was working by himself in the media center. I also learned that this middle school (one of two middle schools in Marksville) has a television production facility that would be the envy of almost any high school anywhere, certainly the envy of Marksville High School. Television productions at MJH are an interdisciplinary effort often involving whole grade levels, and several productions have been telecast on the local PBS station.

When I asked how in the world MJH was able to afford all of that equipment, Barb explained that Mr. Shakes had responded to a call for model schools put out by TCI Cablevision, and as a result, the school won not only the television production lab, but also its new computer lab, a TV and VCR for every classroom, and over the summer a fiber optic connection to the Internet for every classroom in the school. My impression of Mr. Shakes as an uninvolved, almost invisible principal abruptly changed to that of a quiet, but extremely astute man who works behind the scenes to get important things done.

It was during my interview with Mr. Shakes on the third day that I formulated a conjecture about his administrative style and how it might affect, at least to some extent, the remarkable difference in teaching styles that I had observed between the two Discovery teachers, Barb (at MJH) and Marie (at LHMS). For the interview, Mr. Shakes met with me in his office, and throughout the session I had a sense that he was being quite careful to make politically correct statements. At one point I commented on the impressive array of equipment the school boasted, and though obviously pleased, he was modest in his acknowledgment that, yes, he had submitted a proposal to TCI Cablevision—almost as if to say he was only doing his job. Later in the interview I mentioned that I had had the opportunity to sit in on a WISE session, and he was quick to credit "teachers" for getting the WISE chapter started. I wondered out loud, in reference to equity issues, if there was any concern that boys were being left out of this very nurturing kind of activity, and he averred that some parents had asked about that, and he was "just waiting for some teachers to come forward and take that on."

Ruminating on the sharp contrast between Mr. Shakes' proactivity in procuring the television and computer equipment versus his hands-off stance, even in the face of parental concerns, about providing a WISE-type activity for boys, I thought of several possible explanations, including a difference in his own personal interest and/or expertise, or more likely, a sense that principals are responsible for facilities and schedules, whereas teachers are responsible for courses and programs. Whatever the cause, the consequence of Mr. Shakes' apparent {I'm making a major leap here, quite possibly unjustified!} uninvolvement in academic issues bestows on teachers the major responsibility for what happens in classrooms. This sense of ownership for the academic program could be a partial factor in the observed difference in teaching style between Barb and Marie.

Perhaps in a school where the principal seems responsible for everything (as at LHMS), it's easier for teachers not to exert the effort to change.

What is Learned from Hands On Activities?

Impressionistic Tale

Kenneth Tobin - University of Pennsylvania

West Side Middle School

Bridging the Gap: Equity in Systemic Reform

Hands on activities need to be more than manipulation of materials. Unless there is a conscious effort on the part of the teacher and students to develop a scientific discourse, it is possible that the experience of hands on activities will not yield anything much in terms of scientific knowledge. This was most evident in an activity on structure and function undertaken directly after the students had been studying respiration.

Drowning and Frying Worms

Jennifer directed students to read the lab sheet. The lesson is on worms. Students are to work in groups of two so that everyone can get a closer look at a worm and directly manipulate it. Students are given a dissecting tray and are instructed to moisten half of it. Also, they are told to get a cup of water and a pipette.

"Live worms today," Jennifer observed. "We are just making observations. Does a worm have a front end? How does it move? Sketch the worm at the bottom of the page."

The students were excited by the worms and almost immediately the female groups in the class commenced their observations and written records. For the most part, the male students did not commence as quickly or as seriously. However, after a few minutes everyone seemed to be diligently, if expressively, engaged. An African American male is the most inclined to touch the worm whereas others show reticence. As the students worked, the teacher directed their attention to the things she wanted them to notice. Most often she did this by posing questions such as: "How do you tell the difference between the front and back ends? Does it ever move backwards?" Jennifer also suggested things for the students to do. "Move the worm around a bit to see if it moves both ends."

"What is the brown stuff?" asked a male student. The question was ignored but signaled a significant change in the lesson. Apparently finished with the teacher's agenda, the students now began to progressively follow their own agendas and evidence of cruelty became widespread as students observed one another and began to mimic the activities of others. The male student who asked the question began to immerse the worm in water repeatedly. Withdrawing it but always returning it to the water for his own amusement. "Mine died," jokes one student. Immediately Jennifer warned the students not to submerge the worms in water. However, this was a signal for more students to try it. The male students in the class were the leaders in these water experiments and soon they began to dry the worms out on an overhead projector.

One male student set up the overhead to demonstrate movement. The worm did not like the light and movement was evident as the worm endeavored to avoid the light and heat by clinging to fingers and other convenient objects. Many males moved toward the overhead projector. "Fried worms!" remarked one male in a successful effort to impress his peers.

In a timely manner Jennifer called the class to attention and assisted them to tidy away the equipment and animals for the next class. Jennifer asked the students to write their results to

include detailed explanations and a labeled sketch of the worm. The laboratory write up was to be submitted as students left the class.

Conclusions

Throughout the lesson Jennifer's voice was shrill and strained. It was evident that teaching would exact a toll on Jennifer as she taught the same lesson throughout the day. She had problems managing the behavior of students, particularly the males, and the tension of having an observer in the class was apparent. As the day progressed Jennifer became quite fatigued and her patience was often pushed to the limit. It is difficult to imagine how, with her stressful style of teaching, Jennifer has survived as a science teacher for eight years.

I did not see much science in this activity. There was ample manipulation of worms and equipment, but little evidence of canonical science being systematically constructed. The student goals were related to having fun and participating in activities that would involve them in enjoyable interactions with their peers. The teacher also wanted students to have fun but seemed to assume that the manipulation of equipment and worms would provide a basis for science learning. Although the written reports focused attention on a scientific discourse, the manipulations, associated verbal comments and presumably the students' goals were not related to the development of a secondary discourse that was science-like. The activity had the potential for the construction of science but for most students this goal was far from realized.

Care, Interest and Focusing on Tests: Sufficient Keys to Success in Science?

Impressionistic Tale

Kenneth Tobin - University of Pennsylvania

West Side Middle School

Bridging the Gap: Equity in Systemic Reform

A smiling African American female greeted me with enthusiasm as she answered my knock on the door of her classroom. She had heard that I might drop by but was not expecting me at that time. Notwithstanding my visit being somewhat unexpected, I was made to feel welcome even though each class would consist of a review for a test to be administered the next day. With a smile on her face she invited me into her classroom and gestured to a space at the back of the room where I could observe. "Make yourself at home," she remarked as she continued her preparation for the six classes she was to teach that day.

Eliza greeted her students as they made their way into the classroom. The 19 students, 6 of them minorities, were diverse. Tall, short, big, small, noisy, quiet, some laughing and playfully interacting with friends, and others extravagant in their movements and verbal outbursts. Eliza interacted with some of the students and when most were inside she moved to the front desk to attend to some administrative tasks. As the bell sounded to signal the beginning of class Eliza pointed to the front board where she had written the warm up task for the day. The students commenced their work as Eliza completed her administrative duties. After a few minutes Eliza approached the class and initiated a dialogue about the warm up activity.

How deep should the divers expect to go in order to hook bales to the wrecked airplane?

The problem looked incomplete to me but it seemed like a good idea to have a warm-up activity to keep students busy while Eliza dealt with the routine administrative tasks that needed to be done at the beginning of the day. Quickly she completed the attendance register and then with a smile walked to the front of the class.

Eliza: *Boys and girls I am wanting to prepare you for tomorrow's test.*

There was an air of expectancy as she looked toward a picture of a sonar device and a ship.

Eliza: *Can you solve the question with that information?*

There were no initial responses so Eliza gave a hint.

Eliza: *More is needed. Think.*

Finally a female student volunteered a response.

Susan: *Time.*

Eliza: *What else do you need to know?*

Another female suggested distance. Eliza smiled and shook her head. A male student then gave a correct response.

Kevin: *Velocity.*

Eliza: *No. The time is 10 seconds and the velocity is 1500 ms^{-1}.*

Eliza then hinted that a similar question would be on the quiz tomorrow.

Eliza: *Are these values reasonable? What is the depth?*

After several incorrect responses a student volunteered a correct answer of 7,500 meters. That's a deep ocean I thought as I watched the students work at the problem.

Eliza: *Tomorrow I want you to get answers to this so fast ... Not fast. Just to be able to work it out.*

Some students ask about the way Kevin worked out the problem. Can we do it another way? Eliza assures the students that it is fine to use any way to solve the problem.

Eliza: *It is the reasoning that is important.*

An issue to be addressed in science is the relevance of science and its relationship to other knowledge that students have. In this case it is a question of common sense. Is a velocity of 1500 ms^{-1} reasonable for the velocity of sound in water? Is it reasonable to have a ship 7,500 meters below the surface of the sea? Can divers go that far beneath the water? Questions such as these were not raised in the warm up activity and, to the extent that I could see, they were not considered. This might have been yet another example where scientific knowledge was not considered in the realm of everyday life experiences, but was considered as something that is isolated and divorced from everyday events.

She got it!!

Twenty words were listed on the chalk board in readiness for a review activity based on the popular game of bingo. Eliza worked with her homeroom class to produce bingo cards with 20 of the words written in the squares of a card containing four rows and five columns. The words all related in some way to wave motion and sound. "Today we will be reviewing for a test," Eliza announced as she made a transition from one activity to the next. She referred the students to the words on their cards, informed them that they will see the words tomorrow in some way on the test, and distributed some bingo chips. As she walked around the class there was a buzz of background noise, consisting of talk about basketball playoffs, and some favorite tune singing.

Eliza ignored the noise and commenced: "Which one of those words am I describing? All five across is the way to win." She then activated the videodisc and we heard the Doppler effect as a motor vehicle sounded its horn as it approached a pedestrian. The students knew what to do and searched their cards for a word to fit the event shown on the videodisk. Eliza continued quickly, "Sound is a result of this ... (Vibrations). What do we call the area that gets tightly packed together?" For this question Eliza used gestures and facial expressions to give a hint of compressions and rarefactions. Occasionally words such as intensity, which were not on the list, were introduced by Eliza and discussed. The discussion allowed students to have a better understanding of the scientific discourse and to bridge between what they know and understand and the terminology of science.

Eventually a student called out "Study!" Eliza checked the words he had covered and identified a mistake. The game continued. After the next question three students called out "Study" to claim victory. Eliza checked the card of each potential winner and if s/he had five squares covered correctly Eliza tunefully sang "S/he's got it!" and gave the successful student a sweet. The games were presented briskly and occasionally the rules for success changed (e.g., three vertical or diagonal squares need to be covered for a win). Eliza communicated well with students and her

nonverbal moves communicated friendliness and awareness of what students were interested in. She was quite musical and showed rhythm and melody in her movements and voice inflections.

The bingo activity was motivational for most students and they obviously had played many times before. They knew the rules and liked to win to collect their prizes. To be successful, as well as being lucky, a student needed to understand a context, usually presented on a videodisk, and search through a list of words on a card to see if any would serve as an answer to a teacher question. By participating in this way, in a competitive game environment, the students were able to interconnect some of the vocabulary of science and further their understandings of the unit on sound.

Several issues emerge from this vignette. Is this an appropriate activity for students reviewing for a quiz? Eliza thought there was a good fit between what the students needed to know to complete the quiz and the questions and answers embedded in the bingo activity. In addition, the activity was one that broke from the routine in science classrooms and students preferred to engage in bingo than study the terminology from books. However, in my mind there is a serious question about the extent to which this activity reflects authentic science. Is it possible for students to review what they know by participating in activities that engage them in the doing of science? I am always struck by the adage that if you don't use it you lose it. This can apply to science as well. A challenge for teachers is to identify review activities that enable students to engage in the practice of authentic science.

Classroom Management

A feature of Eliza's teaching was her caring approach to all of her students. Eliza's caring attitude permeated all of her interactions with students. She was friendly, smiling and helpful. The issues she discussed demonstrated to students that she was interested in their welfare. The week in which we observed Eliza teach happened to be the end of a grading period. Not only did she give regular advice on how to get good grades in science, but also, she spoke to her science students about what to do to make sure they got the grades they deserved in other courses as well. She advised students to check that all of their work was submitted and to see her and other teachers if they wanted to discuss progress.

In most classes there were few signs of disruptive behavior from students even though there were occasions when Eliza took decisive action to avoid potential problems. On one such occasion Karen appeared angry and showed signs of disrespect for her classmates and Eliza. Without bringing Karen's unacceptable behavior to the attention of the class Eliza moved close to her and asked her to re-locate to a place of relative isolation in the class. When Karen ignored her teacher's suggestions, Eliza returned and quietly insisted. Karen leapt to her feet and slammed the chair backwards onto the floor. Eliza did not react to Karen's petulance and moved back to the front of the class to continue the lesson. Later Eliza walked to the desk in which Karen was seated to ask quietly if she was feeling all right. When Karen said no, Eliza expressed concern in an empathetic manner and offered her assistance.

Eliza anticipated problems and isolated Karen from others in the class in a way that did not draw the attention of other students to what was happening. She did nothing to diminish the self esteem of students and made attempts to ensure they would not lose face in the presence of peers. Her sensitivity to the feelings of her students was reflected in quiet and calm interactions with them, questions about their well being, and even after isolating one or two of them, sincere efforts to encourage their participation in activities. Efforts were made not to bring the public spotlight on to students. Even in circumstances, such as Karen slamming the chair onto the floor, where the student was evidently wanting other students to notice what was happening, Eliza did not draw further attention to the event.

Similar examples arose in other classes. When a male student became angry and disruptive during an activity, he was moved to be by himself. Once again Eliza did not create a problem. She remained positive and, later in a bingo activity, encouraged the student by announcing that he looked as if he would be a winner. The comment was self fulfilling because five minutes later the student began to participate in whole class activities. Moving him away from students in his immediate vicinity apparently removed a source of aggravation or perhaps a need to impress his peers with antisocial actions. Since he was not in the public gaze and had not been reprimanded publicly by the teacher, there was no need for him to save face or to exhibit further non-conforming actions. Eliza's style of teaching enabled her to maintain order in the classroom and elicit appropriate engagement from peripheral participants.

Tests and Grades

Eliza used tests to motivate students to participate and learn. Throughout the review lesson she indicated there would be a test the next day and what was covered was likely to be tested. Accordingly, the test assumed an important part in the lives of these students, exaggerated because I observed Eliza teaching during the final week of a grading period at a time when students still had opportunities to improve their grades if they so desired.

When I arrived to observe the test I was startled by what I observed. Based on the review and comments made about the test, I anticipated a standard paper and pencil quiz. However, part of the test was a group assignment. Four students were assigned to each group, to work at a table on which a flag was mounted on a pole about one meter in length. All students from a group submitted a paper, one of which was selected by Eliza to be graded. Each person in the group thereby was awarded the grade earned by the randomly selected paper. Eliza emphasized that all papers submitted for the group portion of the test should be equivalent.

Setting up the groups was a challenge. One male student who, on the previous day, was isolated at the back of the room, did not want to work with the group to which he was assigned. Finally he negotiated an assignment to a different group. Once again Eliza showed that she could deal with potentially difficult issues in nonconfrontational ways. However, I thought that the student had a good point. Why should he work with students whom he regarded as being less able and unable to contribute to his performance on a test that he regarded as having high stakes? He argued that these students would make him do all of the work and then they would copy what he wrote down. His preference was to work with others whom he respected or to work alone. Although I am an advocate of peer teaching and collaborative forms of learning, I could not see the rationale for this group test. The students were grouped just for the test and one student made a stand based on arguments I would have used myself.

The test was like a laboratory "thought experiment" that investigated: "Why are the strings of stringed instruments able to play notes of different pitch?" The students had not previously been taught about stringed instruments, but on each desk there were books that could be used as resources. "If you need me, please flag me," said Eliza, as the students commenced the test. Eliza asked questions and made encouraging comments as she purposefully moved from group to group. Throughout the lesson students raised their flags as they reached "check points" that required them to contact the teacher or as they encountered problems and needed Eliza to clarify and provide guidance.

The test used in this activity is presented below.

I. Problem: Why are the strings of stringed instruments able to play notes of different pitch?

II. RESEARCH: Inspect the strings of three different stringed instruments. List your observations.

instrument 1:

instrument 2:

instrument 3:

What is common about the strings of all three musical instruments?

III. HYPOTHESIS

_____ enables the stringed instruments to play notes of different pitch.

_____ check point

IV. EXPERIMENT: Design a simple experiment to test your hypothesis. Try to use everyday materials that I may have in my desk or around the house. Once you have written a plan (sketch can be included), write a materials list.

_____ check point

V. DATA:

VI. CONCLUSION:

1. Was your hypothesis correct? Explain how your experiment provided whether or not your hypothesis was correct.

2. What factors affect the pitch of each string?

VII. APPLICATION:

1. Why do guitar players sometimes press the upper part of the string while they pluck at the lower part of the string?

2. The pitch of a male voice becomes lower during a period of development called puberty. What must happen to the vocal cords at this time?

_____ check point

The check point indicates that students cannot proceed past that point without some assistance from the teacher.

Management problems also emerged during this activity. Lori appeared sullen and aggressive during the test. She was in a group of four, two males and two females. Jason had the stature of a football player and appeared to be in charge, while Todd, who was smaller and somewhat "nerdish" brushed Jill's hair. Initially the group discussed their sexual orientations and preferences and only commenced the test when Eliza came toward them. At that time, Jill asked Todd to stop brushing her hair and began to write responses to the test questions. Jason copied Jill's responses and then formed a subgroup with Lori. Eliza, who noticed what happened, permitted the students to remain in separate groups and each subgroup continued to make changes to the responses originally written by Jill. As I watched these subgroups complete the activity I reflected on the many issues associated with assessing students based on their performance in an activity such as this. Among the questions that arose were those pertaining to Jill who got the group started and provided them all with a basis for whatever grade that ultimately was assigned to the group. Then there was Lori who did very little to contribute to the responses to the question and whose aggressive interactions throughout the activity arguably made it difficult for any of the students to show what they knew in an authentic way. Finally there is the issue of the forming of subgroups. Was it fair to allow one group to break up when others were not given this option? In her efforts to avoid conflict, questions of equity arose in this activity. It seemed as if only those who took a position that was counter to Eliza's initial instruction received an opportunity to negotiate with her. Once in a negotiation phase it also appeared that her goal was to minimize conflict and students invariably were able to win concessions.

Conclusions

After my two day visit to Eliza's class I was impressed with the manner in which she had managed to teach so many students from urban areas in which the social class was often a handicap to their learning science. Perhaps the most important aspect of observing Eliza for two days was to see how she was able to teach students without alienating them and, often in the worst of circumstances, to short circuit problems by getting in early and interacting with students in ways that showed an understanding of the culture of students. She knew that they would not want to lose face in the presence of their peers and that they would interact to sustain their status within their peer groups when they were in the public spotlight. Accordingly, Eliza interacted with students in ways that showed her knowledge of their culture and her respect for them as human beings. Her approach to science reflected many years of being a science teacher and her involvement in on-going professional development activities. She was a leader and collaborator with her colleague science teachers within the school and she always was on the lookout for activities that might promote the interest and academic performance of her students. Given that her students were from homes where the per capita income was very low, I was impressed by the extent to which the students cooperated and engaged in activities that might not appear to be all that relevant to the future studies and occupations of students like those in her class. Eliza was able to make a difference in terms of the science education of her students by beginning with what they brought to the classroom and, by obtaining their interests and cooperation, working toward understandings of science.